

DOCUMENT A00805

APPENDIX C

GEO-TECH REPORT AND

BORING LOGS

APPENDIX C

GEOTECHNICAL DATA REPORT (INCLUDING SOIL BORING LOGS) SILVER LINE GATEWAY CHELSEA, MA

GEOTECHNICAL DATA REPORT

**Subsurface Investigation Results for the
MassDOT Silver Line Chelsea Extension
Chelsea, MA
June 2014**

I. INTRODUCTION

A subsurface investigation was conducted to support the design and construction of the MBTA Silver Line Chelsea Extension project in Chelsea, Massachusetts. The subsurface investigation consisted of a general review of the local geology, the drilling and sampling of 63 test borings, the installation of ten monitoring wells, in-situ permeability testing, and the collection and laboratory testing of geotechnical and environmental soil samples and.

The test borings were drilled by Northern Drill Service of Northborough, Massachusetts from November 20, 2013 to February 3, 2014 and logged by an AECOM geotechnical representative. The laboratory testing of collected geotechnical soil samples was performed by GeoTesting Express of Acton, Massachusetts.

An environmental soil pre-characterization study was conducted in tandem with the geotechnical subsurface investigation. Results of the environmental study are provided under separate cover and are not discussed in this data report.

II. PROJECT DESCRIPTION

The purpose of the Silver Line Gateway project is to extend Silver Line Bus Rapid Transit (BRT) service from Boston's South Station and Seaport District to Chelsea and East Boston. The new route would run along the existing Silver Line route to the Blue Line Airport Station and then north and west on existing roads (i.e., *Coughlin Bypass and across the Chelsea Street Bridge*). The route selected for the project will include an out-of-service rail Right-of-Way (ROW) and a portion of the active commuter rail ROW to a terminal station at the Mystic Mall.

The project will include an approximately 1.2 mile long dedicated Bus Way, four new Bus Rapid Transit (BRT) Stations, a Shared Use Path and relocation and reconstruction of the MBTA Chelsea Commuter Rail Station. The project will also include new traffic signals, upgrades to

existing MBTA Commuter Rail Signal System, and replacement of the structurally deficient Washington Avenue Bridge.

III. SUBSURFACE EXPLORATION PROGRAM

A total of 63 test borings were drilled during the subsurface investigation. The test borings ranged in depth from approximately 10 to 110 feet. The test borings were advanced using 4-inch ID HW casing or 3.25-inch ID hollow stem augers. Standard penetration test split spoon soil samples were typically collected at 5-foot intervals and logged by an AECOM field representative in accordance with ASTM standards (ASTM D2488). Thin-walled Shelby or Osterberg tube samples were also taken of the fine-grained soils.

Bedrock was encountered and cored at one boring location (B-47). The B-47 rock core was collected using an NX size core barrel and its in-situ quality determined by calculating the percent recovery and Rock Quality Designation (RQD).

Ten test borings were converted to observation wells upon completion. The test borings not converted to observation wells were backfilled with drill cuttings or a bentonite-cement grout mix. The use of drill cuttings as backfill was restricted to the shallow borings (≤ 30 ft).

The locations of the test borings are shown on Figure 1. The test boring logs from the subsurface investigation are provided in Attachment 1. Survey location data for the borings are summarized in Table 1.

a. OBSERVATION WELLS

The ten observation wells were constructed using Schedule 40 PVC riser and screen, a sand pack, bentonite seal and protective steel road-box. The observation well installation logs are provided in Attachment 2.

Groundwater levels measured in the observation wells during the subsurface investigation ranged from artesian (*i.e., above grade*) to 14.2 feet below ground surface. It should be noted that groundwater levels may fluctuate with precipitation, season, construction activities, run-off controls, and other hydraulic factors. As a result, water levels during construction may vary from those observed during the subsurface investigation. A summary of the groundwater level measurements recorded through May 2014 is provided in Table 2.

b. FALLING HEAD TESTS

One or two stage falling head tests were conducted at six boring locations to observe the hydraulic response of saturated and unsaturated soils. The Stage 1 falling head tests were performed by seating the casing at the test interval (*i.e., flush with the bottom of the borehole*), flushing and filling the casing with clean sediment-free water and recording the drop in head at regular intervals. Once the Stage 1 test was completed, a split spoon sample was driven and withdrawn and a Stage 2 falling head test was performed after topping the casing with clean water. The falling head test data and analyses are provided in Attachment 3.

c. LABORATORY TESTING

A laboratory testing program was performed to determine the engineering properties of encountered site soils and rock. Representative soil samples were selected and tested for physical characteristics (*i.e. moisture content, organic content, Atterberg limits, gradation, shear strength, consolidation, modified proctor and CBR*) and chemical corrosion characteristics (*i.e., resistivity, chloride content, sulfate content and pH*). A rock core sample collected at the B-47 boring location was tested for axial compression. A summary of the soils and rock laboratory testing are provided in Table 3. The laboratory test results are provided in Attachment 4.

FIGURES

604428_HD_(BORING PLAN).DWG Plotted on 26-Feb-2014 4:49 PM

CHELSEA SILVER LINE GATEWAY			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	130
PROJECT FILE NO. 604428			BORING LOCATION PLAN

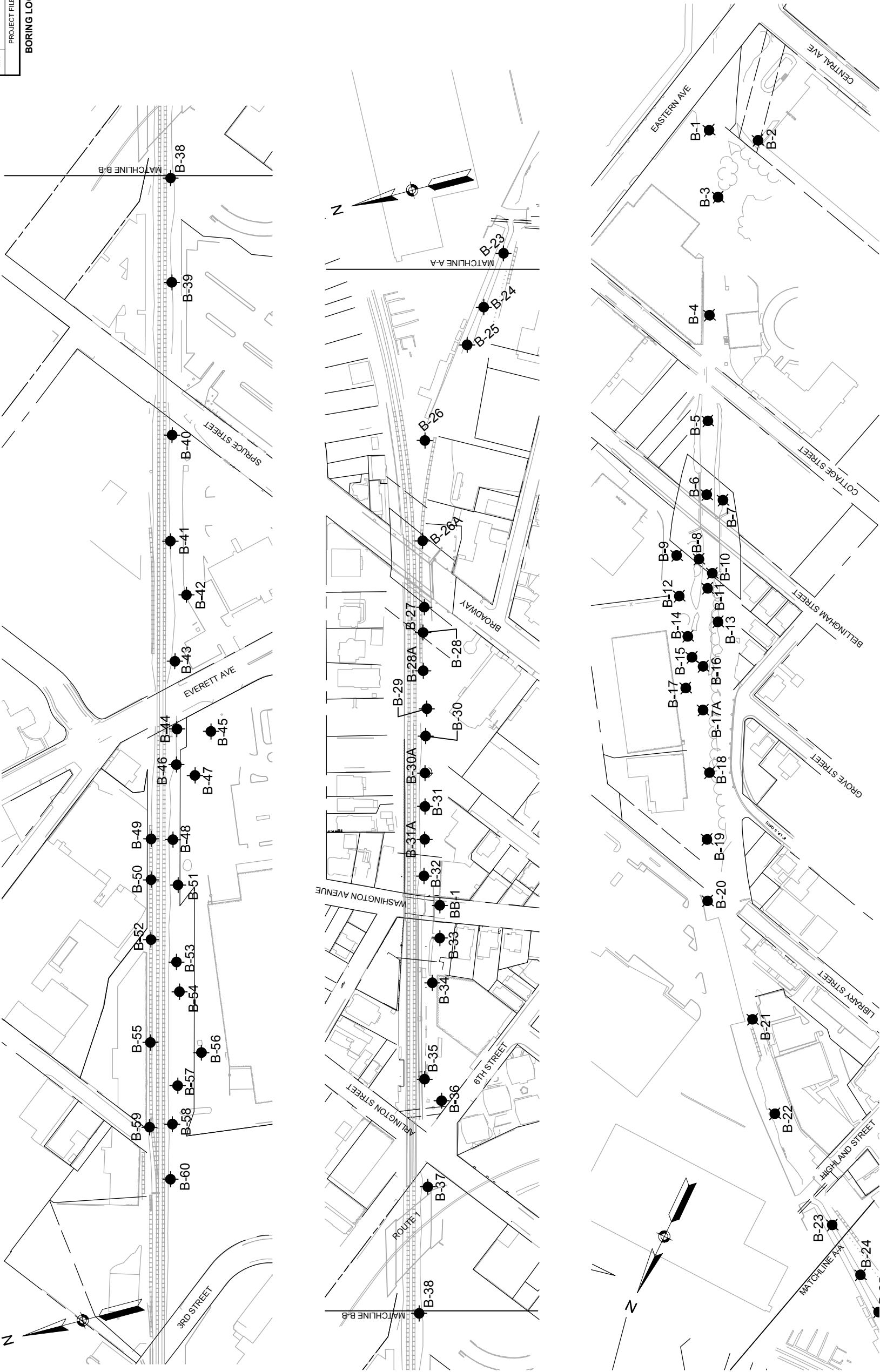


FIGURE 1: BORING LOCATION PLAN

TABLES

TABLE 1: BORING LOCATION SURVEY DATA

BORING	GROUND SURFACE ELEVATION (ft)	COORDINATES		BORING DEPTH (ft)
		NORTHING	EASTING	
B-1	8.4	2966956	784830	21
B-2	10	2966931	784728	27
B-3	9.1	2967075	784752	27
B-4	11.8	2967307	784661	12
B-5	10.7	2967509	784568	21
B-6	11.1	2967650	784503	21
B-7	NOT CONDUCTED			
B-8	NOT CONDUCTED			
B-9	33	2967793	784505	31
B-10	12.3	2967794	784421	31
B-11	13.2	2967827	784416	21
B-12	29	2967867	784463	30
B-13	15.1	2967881	784366	21
B-14	17	2967936	784410	26
B-15	16.2	2967972	784383	26
B-16	15.7	2967979	784354	12
B-17	15.1	2968036	784367	24.5
B-17A	14.2	2968062	784314	21
B-18	11.2	2968175	784245	21
B-19	10.6	2968304	784189	12
B-20	9.9	2968420	784132	21
B-21	9.4	2968604	783939	12
B-22	12.6	2968763	783811	21
B-23	10	2968922	783601	21
B-24	9.8	2968991	783502	21
B-25	10.1	2969045	783434	21
B-26	10.8	2969182	783262	71
B-26A	10.8	2969240	783059	71
B-27	10.7	2969272	782923	12
B-28	10.5	2969288	782872	71
B-28A	10.7	2969308	782794	71
B-29	10.2	2969321	782715	71
B-30	10.2	2969338	782660	12
B-30A	9.8	2969359	782585	71
B-31	9.2	2969377	782517	71
B-31A	8.8	2969395	782450	71
B-32	8.2	2969416	782376	12
B-33	14.3	2969417	782241	81
B-34	9.2	2969456	782154	22
B-35	8.7	2969523	781962	22
B-36	8.7	2969500	781909	61

BORING	GROUND SURFACE ELEVATION (ft)	COORDINATES		BORING DEPTH (ft)
		NORTHING	EASTING	
B-37	8.7	2969574	781741	12
B-38	8	2969659	781488	12
B-39	7.6	2969712	781275	22
B-40	7.4	2969793	780964	12
B-41	8.3	2969853	780749	22
B-42	10.8	2969849	780631	61
B-43	7.9	2969908	780502	9.1
B-44	8.1	2969940	780363	12
B-45	11.7	2969872	780340	21
B-46	7.6	2969960	780291	22
B-47	9.8	2969928	780259	109
B-48	7.9	2970007	780140	71
B-49	7.3	2970051	780153	71
B-50	7	2970073	780070	71
B-51	7.3	2970034	780048	71
B-52	6.9	2970105	779948	12
B-53	6.3	2970065	779889	12
B-54	7.1	2970092	779837	12
B-55	6	2970161	779739	12
B-56	11.9	2970084	779698	16
B-57	6.4	2970144	779641	17
B-58	6.4	2970160	779561	22
B-59	6	2970208	779567	12
B-60	6.4	2970193	779450	17

TABLE 2
GROUNDWATER LEVEL MEASUREMENTS

BORING No.	COORDINATES		ELEVATION Top of Roadbox (ft)	Well Screen DEPTH (ft)	Initial Groundwater Reading (ft)		Groundwater Reading (ft)		Groundwater Reading (ft)		Groundwater Reading (ft)		Groundwater Reading (ft)		Groundwater Reading (ft)		Groundwater Reading (ft)		Groundwater Reading (ft)	
	NORTHING	EASTING			DATE	DEPTH	DATE	DEPTH	DATE	DEPTH	DATE	DEPTH	DATE	DEPTH	DATE	DEPTH	DATE	DEPTH	DATE	DEPTH
B-1	2966945	784791	8.4	10 to 20	11/24/2013	13.9	12/2/2013	14.2	12/31/2013	14.0	under ice+snow	2/22/2014	14.0	3/22/2014	13.8	4/22/2014	13.0	5/21/2014		
B-10	2967794	784421	12.3	19 to 29	12/3/2013	> 0			12/31/2013	> 0	2/3/2014	2/22/2014	> 0	3/22/2014	> 0	4/22/2014	+1.0 *	5/21/2014	+0.3 *	
B-14	2967936	784410	17	10 to 25	11/22/2013	6.9	11/24/2013	5.2	12/31/2013	5.2	2/3/2014	2/22/2014	0.7	3/22/2014	1.0	4/22/2014	1.4	5/21/2014	2.0	
B-20	2968420	784132	9.9	10 to 20	11/29/2013	5.4			12/31/2013	5.6	2/3/2014	2/22/2014	5.1	3/22/2014	5.0	4/22/2014	4.6	5/21/2014	4.6	
B-23	2968922	783601	10	9 to 19	11/26/2013	7.8	11/29/2013	5.3	12/31/2013	4.1	under ice+snow	under snow+ice	3/22/2014	2.2	4/22/2014	2.3	5/21/2014	3.0		
B-26	2969182	783262	10.8	10 to 20	1/23/2014	8.7					2/3/2014	2/22/2014	8.8	3/22/2014	8.0	4/22/2014	7.6	5/21/2014	7.8	
B-30A	2969359	782585	9.8	10 to 20	1/29/2014	5.6					2/3/2014	2/22/2014	4.3	3/22/2014	4.2	4/22/2014	3.2	5/21/2014	3.8	
B-35	2969523	781962	8.7	10 to 20	2/7/2014	5.8					2/10/2014	2/22/2014	4.0	3/22/2014	4.1	4/22/2014	3.0	5/21/2014	3.6	
B-41	2969853	780749	8.3	10 to 20	1/10/2014	4.4					2/3/2014	2/22/2014	3.4	3/22/2014	4.0	4/22/2014	4.0	5/21/2014	3.2	
B-48	2970007	780140	7.9	5 to 15	12/30/2013	5.6			12/31/2013	4.1	2/3/2014	2/22/2014	4.8	3/22/2014	5.4	4/22/2014	5.2	5/21/2014	5.4	

NOTES:

Boring B-10: artesian condition; temporary riser pipe added, + value indicates water level above top of roadbox.

Boring B-23: major surface runoff area, water infiltrating into the roadbox and affecting the water level readings.

Table 3 SUMMARY OF LABORATORY TESTING

Boring No.	Sample Depth (ft)	Sample No.	Laboratory Soil Description	Moisture (%)	Organic Content (%)	Atterberg Limits			Grain Size			UU Shear Strength (tsf)	Lab Vane Shear Strength (tsf)	Rock Bulk Density/ UCS	Precon. Pressure (P _c) (tsf)	Consolidation			Modified Proctor		CBR	Resistivity (ohm-cm)	Chloride Content (mg/kg)	Sulfate Content (mg/kg)	pH of Soil in	
						Plastic Limit (PL)	Liquid Limit (LL)	Plasticity Index (PI)	Gravel, %	Sand, %	Fines, %					Void Ratio (e _v)	Compression Index (C _c)	Recompression Index (C _r)	Maximum Dry Density (corrected) (pcf)	Optimum Moisture Content (corrected)					Distilled Water	Calcium Chloride
B-1	4 to 6	SPT-3	Moist, light olive brown sandy clay with gravel																				24	160	7.0	6.7
	14 to 16	ST-5	Moist, dark grayish brown silt	55		32	53	21				0.013			-	1.40	0.37	0.030								
	19 to 21	SPT-6	Moist, very dark olive gray sandy silt	31		np			0	42	58															
	20 to 22	SPT-5	Moist, dark olive gray clayey sand	37	2.2	np																				
B-2	0 to 4	Bulk	Moist, very dark gray sand with silt and gravel						40	52	8								135.0	6.0	42					
B-3	15 to 17	SPT-4	Moist, dark olive gray clay	45	3.2	26	50	24																		
	4 to 6	SPT-3	Moist, light yellowish brown clay																							
	12 to 14	SPT-6	Moist, olive gray clayey sand	10		13	21	8	10	45	46												93	ND	6.9	6.4
B-15	4 to 6	SPT-3	Moist, light olive brown clay with sand and gravel																							
B-17	9 to 11	SPT-4	Moist, olive gray clay with sand	17		18	34	16	11	15	74															
B-18	19 to 21	SPT-5	Moist, greenish gray clayey sand with gravel	10		12	22	10	17	40	44															
B-21	0 to 10	Bulk	Moist, very dark gray silty sand with gravel						35	49	16								134.0	6.5	35					
B-22	14 to 16	SPT-5	Moist, olive gray clay	27		25	50	25																		
B-24	2 to 4	SPT-1	Moist, olive brown clayey sand																							
B-26	1 to 4	Bulk	Moist, very dark gray sand with silt and gravel						34	56	11															
B-28	9 to 11	SPT-2	Moist, brown sand with gravel																							
B-28A	19 to 21	SPT-4	Moist, light olive brown sand with silt and gravel						40	54	5															
B-30	1 to 3	Bulk	Moist, black silty gravel with sand						47	37	17															
B-33	2 to 4	SPT-1	Dry, grayish brown silty sand with gravel						40	49	11								117.0	9.5	113					
B-36	24 to 26	SPT-6	Moist, olive brown sandy silt						0	37	63															
	9 to 11	SPT-3	Moist, very dark gray clay	20		15	27	12																		
	19 to 21	SPT-5	Moist, olive brown clay	24																						
	29 to 31	SPT-7	Moist, grayish brown sand with silt	22																						
	39 to 41	SPT-9	Moist, light brownish gray clay	31		19	41	22																		
B-37	1 to 5	Bulk	Moist, dark grayish brown sand with silt and gravel																							
B-38	10 to 12	SPT-2	Moist, dark brown silty sand with organics	193	32.6				0	86	14															
B-39	1 to 5	Bulk	Moist, very dark grayish brown gravel with silt and sand						51	44	5								140.5	6.0	69					
B-41	1 to 5	Bulk	Moist, very dark gray sand with silt and gravel						41	53	6								133.0	5.0	32					
B-42	19 to 21	SPT-5	Moist, olive gray clay	34																						
	24 to 26	SPT-6	Moist, olive gray clay	37																						
	39 to 41	SPT-9	Moist, dark olive gray clay	38		23	50	27																		
	49 to 51	ST-5	Moist, dark olive gray clay	38																						
	59 to 61	ST-6	Moist, olive gray clay	34																						
B-44	6 to 8	SPT-1	Moist, yellowish-brown silty, clayey sand with gravel	44	4.7	44	76	32	21	64	16															
B-47	14 to 16	SPT-4	Moist, olive clay	26																						
	19 to 21	SPT-5	Moist, olive clay	34																						
	24 to 26	OT-1	Moist, greenish gray clay	34		21	48	27					0.25		1.6	1.07	0.28	0.047								
	34 to 36	OT-3	Moist, greenish gray clay	37								0.30	0.20		1.9	1.06	0.27	0.041								
	44 to 46	OT-5	Moist, greenish gray clay	44									0.19		2.0	1.24	0.35	0.034								
	59 to 61	OT-7	Moist, greenish gray clay	30		16	30	14				0.53	0.18		3.0	0.87	0.25	0.030								
	79 to 81	OT-9	Moist, greenish gray clay with sand	30								0.41	0.19		3.4	0.84	0.29	0.037								
B-48	104 to 105	Run 1	See photos											168 pcf												
	1 to 5	Bulk	Moist, very dark gray gravel with silt and sand						53	40	8								128.5	5.0	48					
	1 to 5	Bulk	Moist, very dark brown silty sand with gravel																							
B-50	9 to 11	SPT-1	Wet, dark olive brown clay	108																						
	14 to 16	SPT-2	Moist, light brownish gray clay	34		23	49	26																		
	19 to 21	OT-1	Moist, greenish gray clay	36								0.56			3.5	1.00	0.32	0.028								
	29 to 31	SPT-4	Moist, gray clay	41																						
	39 to 41	SPT-6	Moist, light brownish gray clay	39		23	46	23																		
B-51	54 to 56	SPT-9	Moist, olive clay	26																						
	29 to 31	OT-1	Moist, greenish gray clay	38								0.39			2.7	1.05	0.27	0.029								
	64 to 66	OT-2	Moist, greenish gray clay with sand	24								0.25			1.9	0.67	0.13	0.014								
B-52	6 to 8	SPT-1	Wet, very dark brown sandy silt	65	7.8	32	60	28	2	44	54															
B-53	6 to 8	SPT-1	Moist, very dark grayish brown silt with organics																							
B-57	1 to 5	Bulk	Moist, very dark gray sand with silt and gravel						39	51	10								132.0	6.5	33					
B-59	10 to 12	SPT-2	Moist, very dark brown sandy organic silt	167	22.9	85	172	87	0	30	70															

Note: ND stands for "Not Detected". NP stands for "Non Plastic".

ATTACHMENT 1

BORING LOGS

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-1	
MBTA Right of Way Chelsea, MA				LOCATION: N 2966956 E 784830		Elevation: 8.4'		Total Depth: 21.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/20/2013			
DRILL RIG : Mobile B-59 truck				DRILLER : Wayne Tucker		FINISHED : 11/20/2013			
Hole Size : HW casing - 4" ID		Weather : 11/20/13 clear 35 F				Ground Water (Depth/Elev.) : Measured @14.05' bgs (2/22/14)			
Drilling Method : Rotary wash with Roller bit				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	SPT-1	68	48-34	15"	Dry, light brown GRAVEL and SAND, trace silt, very dense FILL	GP to SP	Hazmat sample		
			34-26						
	SPT-2	61	23-26	4"	Dry, light brown GRAVEL and SAND, trace silt, very dense		Hazmat sample		
			35-19						
	SPT-3	20	4-10	6"	Moist, light brown to tan CLAY, little gravel, few sand, very stiff	CL	Chloride content 24 mg/kg Sulfate content 160 mg/kg Resistivity= 2,686 ohm-cm pH= 7.0 (distilled water)		
			10-10						
10	SPT-4	6	5-4	0	Moist, gray CLAY, few peat, medium stiff	CL	after SPT-4, 3" spoon pushed from 9' to 11', 16" recovery		
			2-3						
15	ST-5	-	Push tube	23"	Moist gray-brown SILT	MH	Moisture content 55% Plastic limit 32, Liquid limit 53 plastic index 21		
20	SPT-6	8	4-2	21"	Moist, light olive SILT, little sand, medium stiff	ML	Moisture content 31%, nonplastic		
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-1	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2966956 E 784830		8.4'		21.0	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-6	8	6-4	21"	Moist, light olive SILT, little sand, medium stiff		ML	Moisture content 31%, nonplastic, sand 41.8%, fines 58.2%		
25					End of Boring @ 21.0' bgs			Monitoring well set PVC screen from 10' to 20' bgs, bentonite seal 6' to 8' bgs		
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:						JOB NO.: 60242256		1 of 2		B-2	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:		Total Depth:	
						N 2966931 E 784728		10.0'		27.0'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN:		12/4/2013	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED :		12/4/2013	
Hole Size : 3.25" ID HAS			Weather : 12/4/13 partly cloudy 43 F				Ground Water (Depth/Elev.) : 7' bgs (12/4/13)				
Drilling Method : Hollow Stem Auger						Drilling Fluid : none			Top of Rock (Depth) : Not Encountered		
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5	SPT-1	12	3-5	4"	Dry, wood chips, dark brown to black SAND, little gravel and silt	SM					
			7-5								
10	SPT-2	6	2-4	8"	Moist to Wet, gray brown medium to fine SAND, little gravel, few silt, clay, and peat, loose	SP	gravel in SPT tip	auger grinding thru gravels			
			2-5								
15	SPT-3	6	1-3	16"	Moist, tan fine SAND, little clay, few gravel and silt, loose	SC					
			3-2								
20	SPT-4	2	1-1	24"	Moist, black brown PEAT, little sand and silt, medium stiff	PT					
			1-1								
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%								
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft							
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-2	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2966931 E 784728		10.0'		27.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-5	4	1-2	24"	Moist, dark gray SILT, some fine sand, trace organics and shells, loose	ML	moisture content 37%, Organic matter 2.2%, non-plastic			
			2-1							
	SPT-6	0	woh/20"	24"				Wet, dark gray SILT, some fine sand, trace organics, loose	ML	
			1							
30					End of Boring @ 27.0'					
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		1 of 2	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2967075 E 784752		9.1'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 12/4/2013	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 12/4/2013	
Hole Size : 3.25" ID HAS		Weather : 12/4/13 partly cloudy 43 F				Ground Water (Depth/Elev.) : 5' bgs (12/4/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : none		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	Bulk sample				Dry, brown SAND, some gravel, few silt	GW to SW	Auger spoil as Bulk sample gravel 39.7%, sand 52%, fines 8.3%		
					FILL				
	SPT-1	6	3-3	12"	Dry, brown to black GRAVEL and SAND, few silt, loose	SM			
			3-3		Moist, gray SAND, little silt, trace gravel, loose				
10	SPT-2	2	2-1	16"	Wet, gray SAND, little silt, trace gravel, very loose	SM			
			1-1						
15	SPT-3	4	2-2	4"	Wet, gray CLAY, trace sand and silt, soft	CL			
			2-3						
20	SPT-4	0	woh/24"	24"	Wet, gray CLAY, trace sand and silt, with shells, very soft	CL	moisture content 45%, 3.2% organics Plastic limit 26, Liquid limit 50, Plastic index 24 after ST-3, pushed SPT from 17" to 19' bgs, 24" recovery		
	ST-3	-	PUSH TUBE	0"	Wet, gray fine SAND and SILT, loose	SM to ML			
	SPT-5	1	woh/14"	24"	Wet, gray fine SAND and SILT, loose				
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some	30 to 45%	Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly	>50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-3	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967075 E 784752		9.1'		27.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-5	1	1-1	24"	Wet, gray fine SAND and SILT, loose		SM to ML			
	SPT-6	1	1- 1/12"	24"	Wet, gray fine SAND and SILT, loose		SM to ML			
			1							
30					End of Boring @ 27.0' bgs					
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-4	
MBTA Right of Way Chelsea, MA				LOCATION: N 2967307 E 784661		Elevation: 11.8		Total Depth: 12.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/4/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/4/2013			
Hole Size : 3.25" ID HAS		Weather : 12/4/13 partly cloudy 43 F				Ground Water (Depth/Elev.) : 6' bgs (12/4/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : none		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					asphalt pavement		wood fragments		
					FILL				
	SPT-1	16	4-7	18"	Dry, brown to black GRAVEL and SAND, little silt	GM to SM			
			9-10						
10	SPT-2	9	7-6	9"	Moist, brown SAND, little gravel and silt, loose	SM			
			3-4		Wet, olive gray CLAY, trace gravel, sand, and silt, stiff	CL			
					Wet, olive gray CLAY, trace gravel, sand, and silt, medium stiff	CL			
	SPT-3	3	3-1	14"	Wet, dark brown PEAT, trace sand and silt, soft	PT			
15			2-2		Wet, dark brown CLAY, trace sand, silt, peat, soft	CH			
20					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.					
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-5					
MBTA Right of Way Chelsea, MA				LOCATION: N 2967509 E 784568		Elevation: 10.7'		Total Depth: 21.0					
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/20/2013							
DRILL RIG : Mobile B-59 truck				DRILLER : Wayne Tucker		FINISHED : 11/20/2013							
Hole Size : HW casing - 4" ID		Weather : 11/20/13 clear 35 F				Ground Water (Depth/Elev.) : 6' bgs (11/20/13)							
Drilling Method : Rotary wash with Roller bit				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered							
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS						
5	SPT-1	54	27-29	21"	Dry, light brown GRAVEL, some sand, little silt, with roots, very dense FILL Dry, black GRAVEL and SAND, little silt, very dense	GM to SM	Hazmat sample						
			25-25										
	SPT-2	34	24-16	12"	Dry, light brown to tan SAND, little clay, few gravel and silt, dense	SC	Hazmat sample						
			18-14										
10	SPT-3	37	24-25	21"	Moist, light brown to tan CLAY, little gravel, few sand and silt, hard	CL	Chloride content 93 mg/kg Sulfate content not detected Resistivity= 2,066 ohm-cm pH= 6.9 (distilled water)						
			12-13										
	ST-4	-	Push Tube	3.5"	Dry, tan CLAY, some sand, few gravel, trace silt, hard	CL	Shelby tube attempt 6' to 6.5' bgs, casing refusal 7" bgs roller bit and casing to 7.5' bgs roller bit open hole 7.5' to 21' bgs silt, clay, sand wash						
SPT-5	157	46-67	3"	TILL						CL	Moisture content 10%, Plastic limit 13, Liquid limit 21 Plastic index 8 gravel 9.8%, sand 44.5%, fines 45.7%		
		90-145											
15	SPT-6	53	17-25	14"	Moist olive-gray CLAY, some sand, few gravel, trace silt, hard	CL	after SPT-7, redrove 3" spoon to 21', 12" recovery						
			28-32										
					TILL	CL							
	SPT-7	116	31-60	0"	Dry, gray CLAY, some sand, few gravel, trace silt, hard	CL							
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date			
SPT=2" SPLIT SPOON		few	5 to 10%										
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose			Cohesive Consistency 0-2 Very Soft						
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense			16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256		2 of 2		B-5	
					LOCATION: N 2967509 E 784568		Elevation: 10.7'		Total Depth: 21.0	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-7	116	56-38	0"	Dry, gray CLAY, some sand, few gravel, trace silt, hard		CL	after SPT-7, redrove 3" spoon to 21', 12" recovery		
25					End of Boring @ 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-6			
MBTA Right of Way Chelsea, MA				LOCATION: N 2967650 E 784503		Elevation: 11.1'		Total Depth: 21.0			
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/27/2013					
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/27/2013					
Hole Size : 4" ID HW casing		Weather : 11/27/13 light rain 58 F				Ground Water (Depth/Elev.) : 2.6' bgs (11/27/13)					
Drilling Method : Rotary wash				Drilling Fluid : water		Top of Rock (Depth) : Not Encountered					
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5	SPT-1	33	17-18	16"	Dry, black GRAVEL and SAND, little silt	GM to SM					
			15-12		FILL						
	SPT-2	17	8-8	12"	Wet, gray CLAY, some sand, little gravel, few silt, hard	CL					
			9-15		Moist, gray CLAY, some sand, little gravel, few silt, very stiff					CL	
10	SPT-3	13	6-5	16"	Dry, gray CLAY, some sand, little gravel, few silt, stiff	CL					
			8-13		TILL						
	15	SPT-4	24	10-10	18"	Moist, gray CLAY, some sand, little gravel, few silt, very stiff				CL	
				14-22		TILL					
SPT-5		25	11-13	18"	Moist, gray CLAY, some sand, little gravel, few silt, very stiff	CL					
20											
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%									
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose							
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft							
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
				5-9 Loose 10-29 Med. Dense							
				30-49 Dense 50+ Very Dense							
				16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-6	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967650 E 784503		11.1'		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	25	12-19	18"	Moist, gray CLAY, some sand, little gravel, few silt, medium dense		CL			
25					End of Boring @ 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-9	
MBTA Right of Way Chelsea, MA				LOCATION: N 2967793 E 784505		Elevation: 33.0'		Total Depth: 31.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/3/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/3/2013			
Hole Size : HW casing - 4" ID		Weather : 12/3/13 partly cloudy 45 F				Ground Water (Depth/Elev.) : Not evident			
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
					grass, Moist, brown Topsoil		SPT-3 bouncing at 9.8' bgs, drilled gravels or cobble		
	SPT-1	52	15-24	24"	Dry, brown SAND, some gravel, little silt, very dense	SM			
			28-38						
5	SPT-2	63	22-25	24"	Dry, brown-gray SAND, little gravel and clay, few silt, very dense	SC			
			38-31						
					TILL				
10	SPT-3	62	22-62/3"	6"	Moist, gray GRAVEL and SAND, little clay, few silt, dense	GC to SC			
15	SPT-4	38	13-17	22"	Dry, gray SAND, little gravel and clay, few silt, dense	SC			
			21-28						
					TILL				
20	SPT-5	44	15-20	16"	Moist, olive SAND, little gravel and clay, few silt, dense	SC			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-9	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967793 E 784505		33.0'		31.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-5	44	24-32	16"	Dry, olive SAND, little gravel and clay, few silt, dense		SC			
30	SPT-6	36	13-17 19-24	20"	Moist, olive SAND, little gravel and clay, few silt, dense TILL		SC			
35	SPT-7	32	14-15 17-26	20"	Moist, olive SAND, little gravel and clay, few silt, dense		SC			
40					End of Boring @ 31.0' bgs					
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
						30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-10				
MBTA Right of Way Chelsea, MA				LOCATION:		Elevation:		Total Depth:				
				N 2967794 E 784421		12.3'		31.0'				
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/2/2013						
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/2/2013						
Hole Size :		Weather :				Ground Water (Depth/Elev.) :						
HW casing - 4" ID		12/2/13 cloudy 38 F				Artesian [above road box] (2/22/14)						
Drilling Method :				Drilling Fluid :		Top of Rock (Depth) :						
Rotary wash with Roller Bit				Water		Not Encountered						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	SPT-1	16	4-7	14"	Moist, brown Topsoil, grass FILL	GM to SM						
			9-7		Moist, olive GRAVEL and SAND, little silt							
	SPT-2	17	10-8	12"	Moist, black GRAVEL and SAND, little silt, medium dense	CL						
			9-12		Moist, olive CLAY, some sand, little gravel, few silt, very stiff							
10	SPT-3	33	13-13	18"	TILL	CL						
			20-25							Moist, olive CLAY, some sand, little gravel, few silt, hard		
	15	SPT-4	35	10-15	10"	TILL				CL		
				20-22							Moist, olive CLAY, some sand, little gravel, few silt, hard	
SPT-5		39	14-19	8"	TILL	CL						
										Moist, olive CLAY, some sand, little gravel, few silt, hard		
20												
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance						Approve/Date		
SPT=2" SPLIT SPOON		few 5 to 10%										
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft								
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff								
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard								

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-10	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967794 E 784421		12.3'		31.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-5	39	20-20	8"	Moist, olive CLAY, some sand, little gravel, few silt, hard		CL			
					TILL		CL			
30	SPT-6	60	13-19 41-27	18"	Moist, olive CLAY, some sand, little gravel, few silt, hard		CL			
35	SPT-7	31	11-14 17-19	2"	Moist, olive CLAY, some sand, little gravel, few silt, hard		CL			
40					End of Boring @ 31.0' bgs			PVC well set : screen from 19 to 29' bgs, bentonite seal 15' to 17' bgs		
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
						30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.							
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-11							
MBTA Right of Way Chelsea, MA				LOCATION: N 2967827 E 784416		Elevation: 13.2'		Total Depth: 21.0'							
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/27/2013									
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/27/2013									
Hole Size : HW casing - 4" ID		Weather : 11/27/13 rain 61 F				Ground Water (Depth/Elev.) :									
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered									
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS								
5	SPT-1	11	4-5	6"	Moist, brown GRAVEL and SAND, little silt	GM to SM									
			6-14		FILL	SM									
					Dry, black SAND, some gravel, little silt, medium dense	SM									
	SPT-2	19	11-9	12"	Dry, brown SAND, some gravel, little silt, medium dense	CL									
			10-14		Dry, olive CLAY, some sand, little gravel, few silt, very stiff	CL									
10	SPT-3	37	11-17	22"	TILL	CL	<i>drilled cobbles and gravels 8.5' to 9.5' bgs</i>								
			20-26		Dry, olive CLAY, some sand, little gravel, few silt, hard	CL									
	SPT-4	38	9-15	16"	Dry, olive CLAY, some sand, little gravel, few silt, hard	CL									
			23-66		TILL	CL									
15															
										SPT-5	43	12-20	15"	Dry, gray CLAY, some sand, little gravel, few silt, hard	CL
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date					
SPT=2" SPLIT SPOON		few	5 to 10%												
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose				Cohesive Consistency 0-2 Very Soft							
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense				3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense				16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-11	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967827 E 784416		13.2'		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	43	23-27	15"	Dry, gray CLAY, some sand, little gravel, few silt, hard		CL			
25					End of Boring @ 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-12	
MBTA Right of Way Chelsea, MA				LOCATION:		Elevation:		Total Depth:	
				N 2967867 E 784463		29.0'		30.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/3/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/3/2013			
Hole Size :		Weather :				Ground Water (Depth/Elev.) :			
HW casing - 4" ID		12/3/13 cloudy 40 F				Not Evident			
Drilling Method :				Drilling Fluid :		Top of Rock (Depth) :			
Rotary wash with Roller Bit				Water		Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Moist, brown topsoil and grass	SM			
					Moist, brown SAND, little gravel and silt, concrete chips				
	SPT-1	40	12-21	6"	Dry, brown SAND, little gravel and silt, dense	SM			
			19-15						
	SPT-2	19	17-15	18"	Dry, brown SAND, little gravel and clay, few silt, medium dense	SC			
10									
	SPT-3	41	14-15	14"	Moist, gray brown SAND, little clay, few gravel and silt, dense	SC	drilled cobble and gravels Casing to 9.0' bgs 4" Roller bit open hole to 28.0' bgs		
		26-18							
15					TILL				
	SPT-4	41	12-18	6"	Moist, olive SAND, little clay, few gravel and silt, dense	SC			
20									
	SPT-5	40	15-19	16"	Moist, olive SAND, little clay, few gravel and silt, dense	SC			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-12	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967867 E 784463		29.0'		30.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
25	SPT-5	40	21-23	16"	Moist, olive SAND, little clay, few gravel and silt, dense TILL Moist, olive SAND, little clay, few gravel and silt, very dense Moist, olive SAND, little clay, few gravel and silt, very dense	SC				
	SPT	-	50/0"	0						
30	SPT-6	66	10-33	19"		SC				
			33-38							
	SPT-7	122	63-92	10"		SC				
			30-41							
35					End of Boring @ 30.0' bgs					
40										
45										
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some	30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly	>50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-13	
MBTA Right of Way Chelsea, MA				LOCATION: N 2967881 E 784366		Elevation: 15.1'		Total Depth: 21.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/2/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/2/2013			
Hole Size : HW casing - 4" ID		Weather : 12/2/13 cloudy 40 F				Ground Water (Depth/Elev.) : 5.0' bgs during drilling			
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Moist, tan gravelly, silty SAND	SM			
	SPT-1	9	5-4	3"	Dry, black gravelly, silty SAND, loose	SM			
			5-3		FILL				
	SPT-2	10	4-3	4"	Dry, black gravelly, silty, SAND, medium dense				
10							gray wash Casing to 9.0' bgs Roller bit open hole from 9' to 19' bgs		
					TILL				
	SPT-3	47	14-24	5"	Moist, olive CLAY, some sand, little gravel, few silt, hard	CL			
			23-30						
15									
	SPT-4	60	13-30	10"	Moist, olive CLAY, some sand, little gravel, few silt, hard	CL			
			30-28						
20									
	SPT-5	36	10-17	16"	Moist, olive CLAY, some sand, little gravel, few silt, hard	CL			
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-13	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967881 E 784366		15.1'		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	36	19-20	16"	Moist, olive CLAY, some sand, little gravel, few silt, hard		CL			
25					End of Boring @ 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		1 of 2	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2967936 E 784410		Total Depth:	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 11/21/2013	
DRILL RIG : Mobile B-59 truck						DRILLER : Wayne Tucker		FINISHED : 11/22/2013	
Hole Size :		Weather :				Ground Water (Depth/Elev.) :			
HW casing - 4" ID		11/21/13 cloudy 48 F, 11/22/13 rain 45 F				5.2' bgs (11/24/13)			
Drilling Method :				Drilling Fluid :		Top of Rock (Depth) :			
Rotary wash with Roller bit				WATER		Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
					grass, topsoil and roots, Dry, light brown gravelly, silty SAND, very dense				
					Dry, brown gray GRAVEL and SAND, little clay and silt	GC to SC			
	SPT-1	30	4-18	3"	Moist, brown gray SAND, some gravel, little clay and silt, dense	SC			
			12-7		TILL				
5	SPT-2	15	24-9	4"	Wet, brown gray SAND, some gravel, little clay and silt, medium dense	SC			
			6-3						
10	SPT-3	8	4-4	0	Wet, olive SAND, some clay, little gravel, few silt, wood in tip, loose	SC	repush SPT-3, recovered 5"		
			4-5						
					TILL				
15	SPT-4	46	7-19	0	[strips of wood recovered in spoon]		after SPT-4, pushed 3" spoon from 14' to 16', some wood strips recovered		
			27-23						
	SPT-4A	-	push 3" spoon	16"	Wet, olive CLAY, some sand, little gravel, few silt, and vertical strips of wood	CL			
	SPT-5	53	14-25	0	Wet, olive CLAY, some sand, little gravel, few silt, vertical strips of wood, hard	CL	after SPT-5, pushed 3" spoon 19' to 21', recovered 24"		
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose		Cohesive Consistency 0-2 Very Soft			
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		2 of 2	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2967936 E 784410		17.0'	
Total Depth:		26.0							
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION			ASTM Class.	REMARKS
	SPT-5	53	28-36	0	Wet, olive CLAY, some sand, little gravel, few silt, vertical strips of wood, hard			CL	after SPT-5, pushed 3" spoon 19' to 21', recovery 24"
					TILL				
25	SPT-7	65	16-30 35-52	5"	Moist, olive CLAY, some sand, little gravel, few silt, hard			CL	
					End of Boring @ 26' bgs				PVC well set : screen from 10' to 25' bgs, bentonite seal from 4' to 6' bgs
30									
35									
40									
45									
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density:		0-4 Very Loose		Cohesive Consistency	
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose		10-29 Med. Dense		0-2 Very Soft	
RUN=ROCK CORE		mostly	>50%	30-49 Dense		50+ Very Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
								16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.						
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-15						
MBTA Right of Way Chelsea, MA				LOCATION: N 2967972 E 784383		Elevation: 16.2'		Total Depth: 26.0						
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/21/2013								
DRILL RIG : Mobile B-59 truck				DRILLER : Wayne Tucker		FINISHED : 11/21/2013								
Hole Size : HW casing - 4" ID		Weather : 11/21/13 cloudy 46 F				Ground Water (Depth/Elev.) : Not Encountered								
Drilling Method : Rotary wash with Roller bit				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered								
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS							
5	SPT-1	122	18-83	13"	Dry, light brown GRAVEL and SAND, little silt, very dense	GM to SM	<i>topsoil, grass and roots</i> <i>Hazmat sample</i> <i>Hazmat sample</i>							
			39-37											
	SPT-2	103	68-48	8"										
			55-54											
10	SPT-3	81	40-39	15"	Moist, gray CLAY, little sand, few gravel and silt, hard	CL	<i>no Chloride or Sulfate detected</i> <i>Resistivity= 2,583 ohm-cm</i> <i>pH= 6.7 (distilled water)</i> <i>roller bit open hole 4' to 24' bgs</i>							
			42-87											
	SPT-4	117	29-53	19"										
			64-70											
15	SPT-5	70	15-27	24"	Moist, gray CLAY, little sand, few gravel and silt, hard	CL	 							
			43-55											
	SPT-6	120	120/5"	5"						Moist, gray CLAY, little sand, few gravel and silt, hard	CL	 		
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date						
SPT=2" SPLIT SPOON		few	5 to 10%											
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft										
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff										
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard										

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-15	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2967972 E 784383		16.2'		26.0	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-7	96	24-45	4"	TILL	CL	roller bit open hole to 24' bgs			
			51-60							
30					Dry, gray CLAY, little sand, few gravel and silt, hard	CL				
35					End of Boring @ 26' bgs					
40										
45										

SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
OT=OSTERB. TUBE		some	30 to 45%	Cohesionless Density:		Cohesive Consistency		
RUN=ROCK CORE		mostly	>50%	5-9 Loose 10-29 Med. Dense 30-49 Dense 50+ Very Dense		0-2 Very Soft 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff 16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-16	
MBTA Right of Way Chelsea, MA				LOCATION: N 2967979 E 784354		Elevation: 15.7'		Total Depth: 12.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/22/2013			
DRILL RIG : Mobile B59 truck				DRILLER : Tim Tucker		FINISHED : 11/22/2013			
Hole Size : HW casing - 4" ID		Weather : 11/22/13 rain 45 F				Ground Water (Depth/Elev.) : 5' bgs (11/22/13)			
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	SPT-1	-	100/1"	3"	grass and roots, tan GRAVEL and SAND, little silt	GM to SM			
			300# 10-20		FILL	GC to SC			
			300# 12-11						
	SPT-2	13	9-7	4"	Moist, tan to gray GRAVEL and SAND, little clay and silt, very dense	GC to SC			
			6-8		Wet, gray-brown GRAVEL and SAND, little clay and silt, red brick fragments, medium dense	GC to SC			
10	SPT-3	30	15-15	14"	Wet, olive CLAY, some sand, little gravel, few silt, stiff	CL			
			15-25		TILL	CL			
					Dry, olive CLAY, some sand, little gravel, few silt, very stiff	CL			
15					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-17	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2968036 E 784367		15.1'		24.5'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-6	76	44-63	24"	Moist, gray CLAY, little sand, few gravel and silt, hard		CL	roller bit open hole to 24' bgs		
					TILL					
30	SPT-7	145	145/6"	4"	Dry, gray CLAY, little sand, few gravel and silt, hard		CL	End of Boring @ 24.5' bgs		
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:						JOB NO.: 60242256		1 of 2		B-17A	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:		Total Depth:	
						N 2968062 E 784314		14.2'		21.0'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN:		12/2/2013	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED :		12/2/2013	
Hole Size :			Weather :			Ground Water (Depth/Elev.) :					
HW casing - 4" ID			12/2/13 cloudy 40 F			5' bgs (12/2/13)					
Drilling Method :						Drilling Fluid :		Top of Rock (Depth) :			
Rotary wash with Roller Bit						Water		Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5					Moist, brown Topsoil, grass						
					Wet, gray SAND, some gravel, little silt	SM					
	SPT-1	1	woh/16"	0	FILL						
			1-2								
	SPT-2	8	5-2	10"	Wet, black GRAVEL and SAND, little silt, loose	GM to SM					
10					TILL			gray wash			
	SPT-3	9	4-5	16"	Moist, olive CLAY, little sand, few gravel and silt, stiff	CL					
			4-5								
15											
	SPT-4	22	4-10	20"	Moist, olive CLAY, little sand, few gravel and silt, very stiff	CL					
			12-17								
20											
	SPT-5	27	14-10	12"	Moist, olive gray CLAY, little sand, few gravel and silt, very stiff	CL					
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%									
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft							
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-17A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2968062 E 784314		14.2		31.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	27	17-14	12"	Moist, olive gray CLAY, little sand, few gravel and silt, very stiff		CL			
25					End of Boring at 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-18		
MBTA Right of Way Chelsea, MA				LOCATION: N 2968175 E 784245		Elevation: 11.2'		Total Depth: 21.0'		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/22/2013				
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/22/2013				
Hole Size : HW casing - 4" ID		Weather : 11/22/13 cloudy 45 F				Ground Water (Depth/Elev.) : 4.6' bgs (11/22/2013)				
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5	SPT-1	17	3-4	6"	Moist, brown Topsoil, grass	GM to SM				
			13-100/2"		Dry, tan GRAVEL and SAND, little silt					
	SPT-2	8	12-15	18"	FILL	GM to SM				
			22-16		Moist, brown-olive GRAVEL and SAND, few silt and clay, rubber, medium dense					
			moist, black SAND, little gravel and silt,		SC					
10	SPT-3	25	9-10	20"	Moist, tan and olive stratified SAND, little silt, loose, and SAND, little clay, medium stiff	SM to SC				
			15-20		Wet, stratified tan SAND, little silt, medium dense, and SAND, little clay, very stiff					
	SPT-4	39	16-17	14"	Wet, tan gray stratified SAND and some clay	SC				
			22-70							
20	SPT-5	140	21-50	6"	Moist, olive gray SAND, little gravel and clay, few silt, very dense	SC	moisture content 10%, Plastic limit 12, Liquid limit 22, Plastic index 10			
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some	30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly	>50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
					5-9 Loose 10-29 Med. Dense					
					30-49 Dense 50+ Very Dense					
					16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-18	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2968175 E 784245		11.2		31.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	140	90-65	6"	Moist, olive gray SAND, little gravel and clay, few silt, very dense		SC	gravel 16.8%, sand 39.7%, fines 43.5%		
25					End of Boring at 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-19	
MBTA Right of Way Chelsea, MA				LOCATION: N 2968304 E 784189		Elevation: 10.6'		Total Depth: 12.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/26/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/26/2013			
Hole Size : HW casing - 4" ID		Weather : 11/26/13 cloudy 40 F				Ground Water (Depth/Elev.) : 5' (11/26/13)			
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	SPT-1	36	6-16	7"	Moist, brown Topsoil, grass	SM	olive clay wash		
			20-11		Dry, light brown SAND, some gravel, little silt				
	SPT-2	6	2-2	16"	FILL	SM			
			4-5		Dry, light brown SAND, some gravel, little silt, medium dense				
10	SPT-3	15	4-6	24"	Moist, gray silty SAND	SM			
			9-11		Moist, gray SAND, little silt, and dark brown fine SAND, little silt, few peat, loose				
	Dry, olive CLAY					CL			
	End of Boring at 12' bgs								
15									
20									

SAMPLE TYPES:		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON	trace 0 to 5%						
SS3=3" SPLIT SPOON	few 5 to 10%						
ST=SHELBY TUBE	little 15 to 25%						
RUN=ROCK CORE	some 30 to 45%						
	mostly >50%	Cohesionless Density:		Cohesive Consistency			
		0-4 Very Loose		0-2 Very Soft			
		5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
		30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-20	
MBTA Right of Way Chelsea, MA				LOCATION: N 2968420 E 784132		Elevation: 9.9'		Total Depth: 21.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/26/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/26/2013			
Hole Size : HW casing - 4" ID		Weather : 11/26/13 cloudy 40 F				Ground Water (Depth/Elev.) : 5.6' bgs (12/31/13)			
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	SPT-1	6	3-3	14"	Dry, light brown gravelly, silty SAND Dry, black gravelly, SAND, loose FILL Wet, brown-gray gravelly, silty SAND, loose	SM	<i>drilled gravels or cobble</i> <i>gray clayey wash</i> <i>after SPT-3, pushed 3" spoon from 9' to 11'; 24" recovery</i>		
			3-3						
	SPT-2	6	5-3	18"		SM			
			3-50/0"						
	10	SPT-3	3	2-1		5"			
2-5									
SPT-4		16	4-6	22"	CL				
			10-11						
20	SPT-5	10	1-5	24"	Dry, olive CLAY, stiff	CL			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-20	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2968420 E 784132		9.9'		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	10	5-5	24"	Dry, olive CLAY, stiff		CL			
25					End of Boring at 21' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:						JOB NO.: 60242256		1 of 1				
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:				
						N 2968604 E 783939		9.4'				
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 11/26/2013				
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 11/26/2013				
Hole Size :		Weather :				Ground Water (Depth/Elev.) :						
HW casing - 4" ID		11/26/13 cloudy 37 F				Not Evident						
Drilling Method :					Drilling Fluid :		Top of Rock (Depth) :					
Rotary wash with Roller Bit					Water		Not Encountered					
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	SPT-1	8	4-4	10"	Moist, brown SAND, some gravel, little silt	SM	BULK SAMPLE <i>from driven HW Casing</i> <i>gravel 34.8%, sand 49%, fines 16.2%</i>					
			4-6		Dry, brown to black SAND, some gravel, little silt, loose	SM						
	SPT-2	6	6-4	8"	Dry, brown to black SAND, some gravel, little silt, loose	SM						
			2-3		Moist, olive CLAY, medium stiff	CL						
10	SPT-3	22	6-9	16"	Moist, olive CLAY, very stiff	CL						
			13-17		End of Boring at 12' bgs							
	15											
20												
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date				
SPT=2" SPLIT SPOON		few 5 to 10%										
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose								
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft								
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff								
				5-9 Loose 10-29 Med. Dense								
				30-49 Dense 50+ Very Dense								
				16-30 V-Stiff, 31+ Hard								

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-22		
MBTA Right of Way Chelsea, MA				LOCATION: N 2968763 E 783811		Elevation: 12.6'		Total Depth: 21.0'		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/25/2013				
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/25/2013				
Hole Size : HW casing - 4" ID		Weather : 11/25/13 clear 22 F				Ground Water (Depth/Elev.) : est 9.5' bgs after casing removed				
Drilling Method : Rotary wash with Roller bit				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5	SPT-1	12	7-6	14"	Dry, red-brown GRAVEL and SAND, medium dense, red brick fragments	GP to SP	Hazmat sample			
			6-7							
	SPT-2	7	5-4	10"						Dry, red-brown GRAVEL and SAND, loose, red brick fragments
			3-5							
	SPT-3	6	4-3							
			3-3		Dry, brown gravelly, SAND and SILT, loose FILL	SM to ML				
10	SPT-4	100	100/1"	1"	angular gravel fragments (wash)	GP	casing refusal at 8' bgs, roller bit ahead, casing set to 9' bgs roller bit open hole 9' to 24' bgs gravels or cobbles from 9' to 11.5' bgs			
15	SPT-5	10	woh-4	16"	Moist, olive CLAY, trace fine gravel, stiff	CL	Moisture content 27% Plastic limit 25, Liquid limit 50, Plastic index 25			
			6-10							
20	SPT-6	16	7-7	18"	Dry to Moist, olive CLAY, very stiff	CL				
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few 5 to 10%								
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose						
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft						
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
				5-9 Loose 10-29 Med. Dense						
				30-49 Dense 50+ Very Dense						
				16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-22	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2968763 E 784811		12.6		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-6	16	9-11	18"	Dry to Moist, olive CLAY, very stiff		CL			
25					End of Boring @ 21.0'					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-23				
MBTA Right of Way Chelsea, MA				LOCATION: N 2968922 E 783601		Elevation: 10.0'		Total Depth: 21.0'				
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/25/2013						
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/25/2013						
Hole Size : HW casing - 4" ID		Weather : 11/25/13 cloudy 27 F				Ground Water (Depth/Elev.) : 5.3' bgs (11/29/13)						
Drilling Method : Rotary wash with Roller bit				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	SPT-1	26	38-15 11-9	18"	Dry, brown-black GRAVEL and SAND, medium dense FILL	GW to SW	<i>Hazmat sample</i> <i>Hazmat sample</i>					
	SPT-2	23	12-13 10-6	18"	Dry, brown-black GRAVEL and SAND, medium dense							
	ST-2	-	push tube	19"	Moist, gray CLAY	CL						
	SPT-3	16	12-10 6-7	18"	Wet, gray stratified SAND, little gravel, and fine SAND, little silt, medium dense	SP to SM						
10	SPT-4	18	4-9 9-12	18"	Dry, olive CLAY, trace gravel, sand, and silt, very stiff	CL	<i>roller bit open hole from 9' to 19' bgs</i>					
15	SPT-5	17	3-7 10-11	22"	Dry to Moist, olive CLAY, trace fine gravel and silt, very stiff	CL						
	SPT-6	9	5-4	6"	Moist, olive CLAY, trace fine gravel and silt, stiff	CL						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date				
SPT=2" SPLIT SPOON		few	5 to 10%									
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose								
ST=SHELBY TUBE		some	30 to 45%	Cohesive Consistency 0-2 Very Soft								
RUN=ROCK CORE		mostly	>50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff								
				5-9 Loose 10-29 Med. Dense								
				30-49 Dense 50+ Very Dense								
				16-30 V-Stiff, 31+ Hard								

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION: MBTA Right of Way Chelsea, MA						JOB NO.: 60242256		2 of 2		
						LOCATION: N 2968922 E 783601		Elevation: 10.0'		Total Depth: 21.0'
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-6	9	5-5	6"	Moist, olive CLAY, trace fine gravel and silt, stiff		CL			
25					End of Boring @ 21.0' bgs			Monitoring Well set : PVC screen from 9' to 19' bgs, bentonite seal 5.5' to 7.5' bgs NOTE: water infiltrating well from adjacent puddle		
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency 0-2 Very Soft	
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-24		
MBTA Right of Way Chelsea, MA				LOCATION: N 2968991 E 783502		Elevation: 9.8'		Total Depth: 21.0'		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/26/2013				
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/26/2013				
Hole Size : HW casing - 4" ID		Weather : 11/26/13 light snow 36 F				Ground Water (Depth/Elev.) : 4' bgs (11/26/13)				
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5	SPT-1	17	8-9	18"	Dry, brown SAND, some gravel, few silt and clay FILL Dry, brown SAND, some gravel, few silt and clay, medium dense	SW	Resistivity= 7,231 ohm-cm Chloride content 38 mg/kg Sulfate content 120 mg/kg pH= 5.9 (distilled water)			
			8-6			SW				
	SPT-2	24	6-9	22"	Dry, olive CLAY, trace gravel, sand, and silt, very stiff	CL				
			15-23			CL				
10	SPT-3	17	7-8	8"	Moist, olive CLAY, very stiff	CL				
			9-13			CL				
	15	SPT-4	19	4-9	16"	Wet, olive stratified 1" to 5" SAND, little silt, trace clay medium dense, and 4" CLAY, trace sand and silt, very stiff				SC to CL
				10-11						SC to CL
20		SPT-5	13	6-6	10"	Wet, light brown SAND, little silt, medium dense	SM			
							SM			
	SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
	SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-24	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2968991 E 783502		9.8'		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-5	13	7-7	10"	Wet, light brown SAND, little silt, medium dense		SM			
25					End of Boring at 21' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Chelsea Extension						SHEET		BORING NO.						
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-25						
MBTA Right of Way Chelsea, MA				LOCATION: N 2969045 E 783434		Elevation: 10.1		Total Depth: 21.0						
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 11/25/2013								
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 11/26/2013								
Hole Size : HW casing - 4" ID		Weather : 11/25/13 partly cloudy 33 F, 11/26/13 partly cloudy 36 F				Ground Water (Depth/Elev.) : 8.8' bgs inside 14' of casing (11/26/13)								
Drilling Method : Rotary wash with Roller bit				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered								
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS							
5	SPT-1	23	27-12	18"	Dry, brown and black GRAVEL and SAND, few silt, medium dense FILL Dry, brown and black GRAVEL and SAND, few silt, dense	GW to SW	Hazmat sample							
			11-7											
	SPT-2	44	8-12	12"										
			32-15											
10	SPT-3	24	8-12	8"	Moist, tan GRAVEL and SAND, few silt, medium dense Wet, tan SAND, few silt, medium dense	GW to SW		Silty SAND wash, some gravel water at 8.8' bgs inside 14' of HW casing (11/26/14)						
			12-16											
	SPT-4	14	10-7	14"										
			7-8											
15	SPT-5	31	9-16	14"	Wet, light brown tan SAND, little silt, few gravel, dense	SM		Silty SAND wash, some gravel						
			15-13											
	SPT-6	40	11-16	8						Wet, light brown SAND, little silt, few gravel, dense	SM			
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date						
SPT=2" SPLIT SPOON		few	5 to 10%											
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose				Cohesive Consistency 0-2 Very Soft						
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense				3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense				16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Chelsea Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-25	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969045 E 783434		10.1		21.0	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-6	40	24-17	8	Wet, light brown SAND, little silt, few gravel, dense		SM			
25					End of Boring @ 21.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-26				
MBTA Right of Way Chelsea, MA				LOCATION: N 2969182 E 783262		Elevation: 10.8'		Total Depth: 71.0'				
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/20/2014						
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/21/2014						
Hole Size : HW Casing - 4" ID		Weather : 01/20/14 cloudy 34 F; 01/21/14 cloudy 13 F				Ground Water (Depth/Elev.) : Measured @ 8.8' bgs (1/23/14)						
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	BULK SAMPLE				Dry, roadbed ballast stone and black GRAVEL and SAND, few silt	GW to SW	Hand auger to 6' bgs (1/14/14) Hazmat sample					
					Dry, tan SAND, some gravel, few silt	SW	gravel 33.6%, sand 55.6% fines 10.8% Hazmat sample					
							sand, gravel, and silt in wash					
10	SPT-1	18	10-10	10"	Wet, tan SAND, some gravel, little silt, medium dense	SM						
			8-8									
		SPT-2	19	7-13			8"	Wet, tan SAND, some gravel, trace silt, medium dense	SW	water level at 8.8' inside 64' casing (01/21/14)		
				6-8						sand, silt, and fine gravel in wash		
15	SPT-3	20	10-11	10"	Wet, tan SAND, some gravel, few silt, medium dense	SW						
			9-7				sand, silt, and fine gravel in wash					
20	SPT-4	27	8-13	16"	Wet, tan SAND, some gravel, few silt, medium dense	SW						
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date			
SPT=2" SPLIT SPOON		few	5 to 10%									
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft							
OT=OSTERB. TUBE		some	30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly	>50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-26			
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:			
					N 2969182 E 783262		10.8'		71.0'			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS				
25	SPT-4	27	14-10	8"	Wet, tan SAND, some gravel, few silt, medium dense		SW	sand, gravel, and silt in wash				
30	SPT-5	31	12-16 15-12	12"	Wet, tan SAND, some gravel, few silt, dense		SW	2" layers of SAND, few silt				
35	SPT-6	20	10-12 8-10	12"	Wet, tan stratified, SAND, some gravel, and SAND, few silt, medium dense		SW	sand, gravel, and silt in wash				
40	SPT-7	40	7-19 21-16	16"	Wet, tan stratified GRAVEL, some sand, and SAND, little silt, dense		GW to SM	sand, silt, and fine gravel in wash				
45	SPT-8	23	9-11 12-11	12"	Wet, tan stratified, SAND, some gravel, and SAND, little silt, medium dense		SW to SM					
	SPT-9	15	6-7	14"	Wet, tan SAND, little silt, medium dense		SM					
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance					Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%									
SS3=3" SPLIT SPOON		little	15 to 25%									
OT=OSTERB. TUBE		some	30 to 45%									
RUN=ROCK CORE		mostly	>50%									
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency		0-2 Very Soft	
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard			

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GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-26	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969182 E 783262		10.8'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-14	26	14-21	21"	Wet, tan stratified CLAY, very stiff, and SAND, little silt, medium dense		CL to SM			
					End of Boring @ 71.0' bgs					
75										
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-26A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969240 E 783059		10.8'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-4	32	13-13	8"	Wet, tan gravelly, silty SAND, dense		SM	<i>Silty SAND wash, some fine gravel</i>		
30	SPT-5	50	45-30 20-12	7"	Wet, tan gravelly, silty SAND, very dense		SM	<i>gravel in SPT tip</i> <i>Silty SAND wash, some fine gravel</i>		
35	SPT-6	24	36-12 12-14	6"	Wet, tan, gravelly, silty SAND, medium dense		SM	<i>gravel in SPT tip</i> <i>Silty SAND wash, some fine gravel</i>		
40	SPT-7	26	11-13 13-13	12"	Wet, tan gravelly, silty SAND, medium dense		SM	<i>4" HW casing to 34' (1/21/14)</i> <i>3" NW casing to 69' (1/23/14)</i> <i>Silty SAND wash, some fine gravel</i>		
45	SPT-8	26	11-15 11-12	14	Wet, tan stratified gravelly SAND and silty medium to fine SAND, medium dense		SW to SM	<i>Silty sand wash, little fine gravel</i>		
45	SPT-9	36	13-11	5"	Wet, gravelly, silty SAND, dense		SM			
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency 0-2 Very Soft	
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-26A	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969240 E 783059		Elevation: 10.8'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-9	36	25-26	5"	Wet, tan gravelly, silty SAND, dense	SM	Silty sand wash, few fine gravel			
55	SPT-10	32	26-15 17-7	6"	Wet, tan gravelly, silty SAND, dense	SM	gravel in SPT tip Silty sand wash, few fine gravel Silty sand 18" up into casing after washout, rewash twice before SPT-11			
60	SPT-11	23	12-11 12-18	2"	Wet, tan gravelly, silty SAND, medium dense	SM	gravel in SPT tip Silty sand wash, little fine gravel			
65	SPT-12	17	20-10 7-6	4"	Wet, tan ghravelly, silty SAND, medium dense	SM	gravel in SPT tip Silty sand wash, little fine gravel			
70	SPT-13	25	6-7 18-14	10"	Wet, tan gravelly, silty SAND, medium dense	SM	Silty sand wash, little fine gravel			
	SPT-14	23	13-11	0		(SM)	3" spoon to 71'- no recovery			

SAMPLE TYPES:	trace	0 to 5%	SPT Resistance				Approve/Date
	few	5 to 10%					
	little	15 to 25%					
	some	30 to 45%					
OT=OSTERB. TUBE	mostly	>50%					
RUN=ROCK CORE							

Cohesionless Density:		0-4 Very Loose	Cohesive Consistency	0-2 Very Soft
5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-26A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969240 E 783059		10.8'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-14	23	12-14	0			(SM)	3" spoon to 71'- no recovery		
					End of Boring @ 71.0' bgs					
75										
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
						10-29 Med. Dense				
						30-49 Dense	16-30 V-Stiff, 31+ Hard			
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-28		
MBTA Right of Way Chelsea, MA				LOCATION: N 2969288 E 782872		Elevation: 10.5'		Total Depth: 71.0'		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/16/2014				
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/17/2014				
Hole Size : HW Casing - 4" ID		Weather : 01/16/14 cloudy 36 F; 01/17/14 partly cloudy 38 F				Ground Water (Depth/Elev.) : 8.5' bgs (1/17/14)				
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5					Dry, roadbed ballast stone and black GRAVEL and SAND, little silt	GM to SM	Air Knife from 0' to 6' (1/16/14)			
10	SPT-1	34	10-17 17-17	10"	Dry, tan GRAVEL and SAND, little silt, dense	GM to SM	Silty sand wash, some fine gravel water at 8.5' bgs inside 44' of HW casing (1/17/14) Wet SPT sample at 9' bgs Resistivity= 10,527 ohm-cm Chloride and Sulfate not detected pH= 6 (distilled water)			
15	SPT-2	17	6-10 7-6	8"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	Silty sand wash, some fine gravel gravel in SPT tip Silty sand wash, some fine gravel			
20	SPT-3	15	7-8 7-9	6"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	Silty sand wash, some fine gravel gravel in SPT tip Silty sand wash, some fine gravel			
	SPT-4	30	19-21	6"	Wet, tan GRAVEL and SAND, little silt, dense	GM to SM	gravel in SPT tip			
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency	
					5-9 Loose		10-29 Med. Dense		0-2 Very Soft	
					30-49 Dense		50+ Very Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
									16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-28	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969288 E 782872		Elevation: 10.5'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
	SPT-4	30	9-6	6"	Wet, tan GRAVEL and SAND, little silt, dense	GM to SM	<i>gravel in SPT tip</i> <i>Silty sand wash, some fine gravel (SM)</i>			
25	SPT-5	14	8-6 8-11	6"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	<i>Silty sand wash, some fine gravel (SM)</i>			
30	SPT-6	16	5-9 7-6	6"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	<i>Silty sand wash, some fine gravel (SM)</i>			
35	SPT-7	10	5-4 6-7	10"	Wet, tan stratified GRAVEL, some sand, and SAND, little silt, medium dense	GW to SM	<i>Silty sand wash, some fine gravel (SM)</i>			
40	SPT-8	16	6-8 8-5	6"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	<i>Silty sand wash, little fine gravel (SM)</i>			
45	SPT-9	11	6-6	6"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM				

SAMPLE TYPES:	trace	0 to 5%	SPT Resistance				Approve/Date	
	SPT=2" SPLIT SPOON	few	5 to 10%					
	SS3=3" SPLIT SPOON	little	15 to 25%					
	OT=OSTERB. TUBE	some	30 to 45%					
RUN=ROCK CORE	mostly	>50%						

Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft
		5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
		30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-28	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969288 E 782872		Elevation: 10.5'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-9	11	5-5	6"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	3" Roller Bit used to washout casing from 44' to 59'			
							Silty sand wash, few fine gravel (SM)			
55	SPT-10	13	6-6 7-7	3"	Wet, tan GRAVEL, some sand, little silt, medium dense	GM	gravel in SPT tip			
							Silty sand wash, few fine gravel (SM)			
							Silty sand 18" up into casing after washout, rewash twice to 54'			
							gravel in SPT tip, 3" spoon drive to 56', 10" recovery			
60	SPT-11	12	4-7 5-5	3"	Wet, tan SAND, little gravel and silt, medium dense	SM	Silty sand wash, few fine gravel (SM)			
							4" Roller Bit used to washout casing from 59' to 69'			
							gravel in SPT tip			
							Silty sand wash, little fine gravel (SM)			
65	SPT-12	25	4-13 12-9	6"	Wet, tan GRAVEL, some sand, little silt, medium dense	GM				
70	SPT-13	17	9-8 9-12	3"	Wet, tan GRAVEL, some sand, little silt, medium dense	GM	Silty sand wash, little fine gravel (SM)			
70	SPT-14	18	9-8	2"	Wet, tan GRAVEL and SAND, little silt, medium dense	GM to SM	3" spoon to 71', 6" recovery			

SAMPLE TYPES:		trace	0 to 5%	SPT Resistance		Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%				
SS3=3" SPLIT SPOON		little	15 to 25%				
OT=OSTERB. TUBE		some	30 to 45%				
RUN=ROCK CORE		mostly	>50%				
				Cohesionless Density:	0-4 Very Loose	Cohesive Consistency	0-2 Very Soft
				5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
				30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-28	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969288 E 782872		10.5'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-14	18	10-11	2"	Wet, tan GRAVEL and SAND, little silt, medium dense		GM to SM	3" spoon to 71', 6" recovery		
					End of Boring @ 71.0' bgs					
75										
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.								
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-28A								
MBTA Right of Way Chelsea, MA				LOCATION: N 2969308 E 782794		Elevation: 10.7'		Total Depth: 71.0'								
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/15/2014										
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/16/2014										
Hole Size : HW Casing - 4" ID		Weather : 01/15/14 clear 40 F, 01/16/14 cloudy 36 F				Ground Water (Depth/Elev.) : 9' bgs (1/16/14)										
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered										
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS									
5	Bulk Sample				Dry, roadbed ballast stone and black GRAVEL and SAND, little silt	GM to SM	<i>Air Knife to 6'bgs (1/14/14)</i>									
					FILL											
					Dry, tan GRAVEL and SAND, few silt	GW to SW										
10	SPT-1	24	10-13	10"	Wet, tan GRAVEL and SAND, few silt, medium dense	GW to SW	<i>Silty sand wash, some fine gravel</i>									
			11-12													
		17	7-8	10"						Wet, tan SAND, some gravel, few silt, medium dense	SW	<i>water at 9' bgs inside 59' of HW casing (1/16/14)</i>				
			9-8													
15	SPT-2	16	7-8	10"	Wet, tan SAND, some gravel, few silt, medium dense	SW	<i>Silty sand wash, some fine gravel</i>									
			8-7													
		20	SPT-3	15						5-7	0"	Wet, tan SAND, some gravel, few silt, medium dense	SW	<i>gravel in SPT tip</i>		
SPT-4	15			5-7	0"	Wet, tan SAND, some gravel, few silt, medium dense	SW	<i>3" spoon pushed 19' to 21', 10" recovery</i>								
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date							
SPT=2" SPLIT SPOON		few	5 to 10%													
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose		Cohesive Consistency 0-2 Very Soft									
OT=OSTERB. TUBE		some	30 to 45%		5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff									
RUN=ROCK CORE		mostly	>50%		30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard									

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-28A	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969308 E 782794		Elevation: 10.7'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
25	SPT-4	15	8-9	0	Wet, tan SAND, some gravel, few silt, medium dense	SW	3" spoon pushed 19' to 21'; 10" recovery gravel 40.4%, sand 54.2%, fines 5.4%			
30	SPT-5	21	8-12 9-10	0	Wet, tan SAND, some gravel, few silt, medium dense	SW	3" spoon pushed 24' to 26'; 10" recovery Silty sand wash, some fine gravel (SM)			
35	SPT-6	6	4-3 3-5	0	Wet, tan GRAVEL, some sand, few silt, loose	GW	3" spoon pushed 29' to 31'; 6" recovery Silty sand wash, some fine gravel (SM)			
40	SPT-7	12	7-7 5-3	0	No Recovery		3" spoon pushed to 36'; no recovery Silty sand wash, some fine gravel (SM)			
45	SPT-8	6	3-3 3-3	0	No Recovery	GW	recovered only angular "wash" gravel in SPT-8 Silty sand wash, some fine gravel (SM)			
45	SPT-9	14	7-8	4"	Wet, tan SAND, little gravel, few silt, medium dense	SW				

SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%						
OT=OSTERB. TUBE		some	30 to 45%						
RUN=ROCK CORE		mostly	>50%						
				Cohesionless Density:		0-4 Very Loose		Cohesive Consistency	0-2 Very Soft
				5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
				30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-28A			
MBTA Right of Way Chelsea, MA					LOCATION: N 2969308 E 782794		Elevation: 10.7'		Total Depth: 71.0'			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
	SPT-9	14	6-6	4"	Wet, tan SAND, little gravel, few silt, medium dense	SW	<i>Silty sand wash, some fine gravel (SM)</i> <i>gravel in SPT tip</i> <i>Silty sand wash, few fine gravel (SM)</i> <i>Silty sand wash, few fine gravel (SM)</i> <i>gravel in SPT tip</i> <i>gravelly wash</i> <i>gravel in SPT tip</i> <i>Silty sand wash, some fine gravel (SM)</i> <i>3" spoon pushed to 71', no recovery</i>					
50	SPT-10	12	7-7 5-6	4"	Wet, GRAVEL, trace sand and silt, medium dense	GW						
55	SPT-11	7	2-3 4-5	5"	Wet, GRAVEL, trace sand and silt, loose	GW						
60	SPT-12	53	9-30 23-12	4"	Wet, tan GRAVEL, little sand, few silt, very dense	GW						
65	SPT-13	7	7-4 3-4	6"	Wet, tan GRAVEL and SAND, few silt, loose	GW to SW						
70	SPT-14	9	5-6	3"	Wet, tan GRAVEL and SAND, few silt, loose	GW to SW						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance							Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%									
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose							Cohesive Consistency 0-2 Very Soft	
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense							3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense							16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-28A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969308 E 782794		10.7'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-14	9	3-3	3"	Wet, tan GRAVEL and SAND, few silt, loose		GW to SW	3" spoon pushed to 71', no recovery		
					End of Boring @ 71.0' bgs					
75								bentonite and cement Grout placed from 0' to 71' bgs		
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose					Cohesive Consistency 0-2 Very Soft	
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense					3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense					16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-29			
MBTA Right of Way Chelsea, MA				LOCATION: N 2969321 E 782715		Elevation: 10.2'		Total Depth: 71.0'			
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/24/2014					
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/27/2014					
Hole Size : HW Casing - 4" ID		Weather : 01/24/14 clear 10 F; 01/27/14 cloudy 35 F				Ground Water (Depth/Elev.) : 9' bgs inside 54' casing (1/27/14)					
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered					
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5	Air Knife 1/14/14				Dry, roadbed ballast stone and black GRAVEL and SAND, little silt	GM to SM					
10	SPT-1	13	9-6	12"	Dry, tan GRAVEL and SAND, little silt	GM to SM					
			7-10								
15	SPT-2	28	7-15	3"	Moist, olive CLAY, trace silt, stiff	CL					
			13-12								
20	SPT-3	22	11-12	0	Wet, GRAVEL, olive clay on gravel, medium dense	SM	Silty clayey SAND wash, little gravel [SM] water at 9' bgs inside 54' of HW casing (1/27/14) Silty sand wash, some gravel [SM] after SPT-3, pushed 3" spoon from 14' to 15.5', 3" recovery Silty sand wash, some gravel [SM]				
			10-10								
20	SPT-4	15	13-8	10"	Wet, light brown SAND, some gravel, little silt, medium dense	SW					
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%								
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose						
OT=OSTERB. TUBE		some	30 to 45%		Cohesive Consistency 0-2 Very Soft						
RUN=ROCK CORE		mostly	>50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
					5-9 Loose 10-29 Med. Dense						
					30-49 Dense 50+ Very Dense						
					16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET		BORING NO.					
SITE LOCATION:					JOB NO.: 60242256		2 of 4					
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:					
					N 2969321 E 782715		10.2'					
Total Depth:		71.0'										
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
25	SPT-4	15	7-7	10"	Wet, light brown SAND, some gravel, few silt, medium dense	SW	Silty sand wash, some fine gravel [SM]					
30	SPT-5	21	8-10 11-12	14"	Moist, brown SAND, few gravel, trace silt, medium dense	SW			Silty sand wash, some fine gravel (SM)			
35	SPT-6	26	16-13 13-10	12"	Moist, tan SAND, some gravel, few silt, medium dense	SW					Silty sand wash, some fine gravel (SM)	
40	SPT-7	14	11-7 7-10	18"	Wet, tan SAND, some gravel, few silt and clay, medium dense	SW	Silty sand wash, some fine gravel (SM)					
45	SPT-8	15	8-8 7-7	12"	Wet, tan SAND, some gravel, little silt, trace clay, medium dense	SW			Silty sand wash, some fine gravel (SM)			
	SPT-9	28	11-12	22"	Moist, tan SAND, little silt and clay, medium dense	SC - SM						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance							Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%									
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose		Cohesive Consistency 0-2 Very Soft						
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-29	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969321 E 782715		Elevation: 10.2'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-9	28	16-13	22"	Moist, light gray CLAY, very stiff	CL	CLAY and silty sand wash CLAY and silty sand wash gravel driven thru SPT sample silty sand came into casing, to 56', after SPT-12 drive gravel and silt in SAND wash [SM] gravel and silt in SAND wash [SM]			
	SPT-10	11	6-6	24"	Dry, light gray CLAY, silt and fine sand lenses, stiff	CL				
			5-9							
55	SPT-11	21	8-9	16"	Moist, stratified light gray CLAY, very stiff, and tan medium to fine SAND, few silt, medium dense	CL and SM				
			12-12							
	60	SPT-12	33	15-13	12"	Moist, olive CLAY, hard				
20-15										
65		SPT				NO SAMPLE - miscount on drill rods during rotary washout from 59'				
	70	SPT-13	16	11-8	4"	Wet, olive SAND, little gravel and silt, medium dense	SM			
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:						JOB NO.: 60242256		1 of 1				
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:				
						N 2969338 E 782660		Total Depth:				
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 1/31/2014				
DRILL RIG : ATV Mobile B48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 1/31/2014				
Hole Size : 3.25" ID		Weather : 1/31/14 cloudy 40 F				Ground Water (Depth/Elev.) : 6.0' bgs (1/31/14)						
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	Bulk Sample				Dry, black GRAVEL and SAND, little silt	GM to SM	<i>Air Knife to 4' bgs (1/14/14)</i> <i>water at 3' (1/14/14)</i> <i>Moisture content 9.5%</i> <i>gravel 46.8%, sand 36.7%</i> <i>finest 16.5%</i>					
					FILL							
10	SPT-1	29	4-14	5"	Wet, tan SAND, little gravel and clay, few silt, medium dense	SC	<i>gravelly sand auger spoil</i> <i>Auger plug dry at 6' bgs</i>					
			15-12									
15	SPT-2	31	4-16	14"	Wet, tan SAND, little gravel and clay, few silt, dense	SC	<i>gravelly sand auger spoil</i> <i>Auger plug wet at 9' bgs</i>					
			15-6									
					Moist, olive clay, very stiff	CL						
					End of Boring @ 12.0' bgs							
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date					
SPT=2" SPLIT SPOON		few 5 to 10%										
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose							Cohesive Consistency 0-2 Very Soft		
ST=SHELBY TUBE		some 30 to 45%	5-9 Loose 10-29 Med. Dense							3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
RUN=ROCK CORE		mostly >50%	30-49 Dense 50+ Very Dense							16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-30A	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969359 E 782585		Elevation: 9.8'		Total Depth: 71.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/27/2014			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/28/2014			
Hole Size : HW Casing - 4" ID		Weather : 01/27/14 cloudy 30 F; 01/28/14 cloudy 15 F				Ground Water (Depth/Elev.) : Measured @ 5.6 bgs (1/30/14)			
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	Air Knife 1/14/14				Dry, roadbed ballast stone and black GRAVEL and SAND, little silt	GM to SM			
					FILL				
10	SPT-1	11	3-4	10"	Moist, tan GRAVEL and SAND, little clay, few silt	GC to SC			
			7-13						
	SPT-2	23	8-11	6"	Moist, olive CLAY, trace gravel, sand and silt, stiff	CL			
			12-19						
15	SPT-3	27	10-11	16"	Moist, tan CLAY, trace gravel, sand, and silt, very stiff	CL			
			16-15						
20	SPT-4	25	10-10	12"	Wet, tan stratified SAND, little gravel, and medium to fine sand, little silt, medium dense	SW to SM	Silty sand wash, little gravel		
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-30A	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969359 E 782585		Elevation: 9.8'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
25	SPT-4	25	15-18	12'	Wet, tan stratified SAND, little gravel, and medium to fine SAND, little silt, medium dense	SW to SM				
30	SPT-5	42	22-15 27-32	12"	Wet, light gray SAND, little gravel and clay, few silt, dense	SC				
35	SPT-6	87	12-57 30-21	6"	Moist, light gray GRAVEL and SAND, few silt, trace clay, very dense	GW to SW				
40	SPT-7	55	15-27 28-18	12"	Wet, light gray GRAVEL and SAND, few silt and clay, very dense	GW to SW				
45	SPT-8	49	42-29 20-19	3"	Wet, light gray GRAVEL and SAND, little clay, few silt, dense	GC to SC				
45	SPT-9	17	8-8	24	Moist, light gray CLAY, very stiff	CL				
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency 0-2 Very Soft	
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	



PROJECT : MassDOT Silve Line Extension						SHEET	BORING NO.
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256	3 of 4	B-30A
					LOCATION: N 2969359 E 782585		
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS
	SPT-9	17	9-10	24"	Moist, light gray CLAY, very stiff	CL	gravel driven thru SPT sample
50	SPT-10	40	13-19	10"	Moist, light gray CLAY, hard	CL	
			21-17				
55	SPT-11	62	40-35	18"	Dry, light gray CLAY, hard	CL	
			27-31				
60	SPT-12	20	11-10	10"	Wet, light brown SAND, little silt, medium dense	SM	
			10-14				
65	SPT-13	31	12-15	14"	Wet, tan to olive fine SAND, little silt, dense	SM	
			16-23				
70	SPT-14	39	12-16	24"	Dry, gray-tan CLAY, fine sand lenses, hard	CL	
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few 5 to 10%					
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density:		Cohesive Consistency		
OT=OSTERB. TUBE		some 30 to 45%	5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
RUN=ROCK CORE		mostly >50%	30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION: MBTA Right of Way Chelsea, MA						JOB NO.: 60242256		1 of 4		B-31	
						LOCATION: N 2969377 E 782517		Elevation: 9.2'		Total Depth: 71.0'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN:		1/29/2014	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED :		1/30/2014	
Hole Size : HW Casing - 4" ID			Weather : 01/29/14 cloudy 15 F; 01/30/14 clear 15 F				Ground Water (Depth/Elev.) : 5.6 bgs (1/29/14)				
Drilling Method : Rotary Wash with Roller Bit						Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS			
5	BULK SAMPLE				Dry, roadbed ballast stone and black GRAVEL and SAND, few silt	GM to SM	Air Knife to 4.6' bgs (1/14/14) HAZMAT SAMPLE				
10	SPT-1	10	5-4 6-6	18"	Dry, tan medium to fine SAND, some gravel, little clay	SC	HAZMAT SAMPLE				
15	SPT-2	20	9-10 10-14	12"	Dry, tan medium to fine SAND, little clay, medium dense	SC					
20	SPT-3	30	11-11 19-25	22"	Moist, tan CLAY, trace fine sand and silt, stiff	CL	Roller bit thru gravels Roller bit open hole and sample before advancing casing sand, and fine gravel in CLAY wash				
20	SPT-4	21	10-10	16"	Dry, tan CLAY, trace gravel, sand, and silt, stiff	CL	Roller bit open hole and sample before				
20	SPT-3	30	11-11 19-25	22"	Dry, tan, stratified CLAY, few fine gravel and sand, very stiff, and medium to fine SAND, little clay, dense	CL to SC	Roller bit open hole and sample before				
20	SPT-4	21	10-10	16"	Dry, tan medium to fine SAND, trace gravel and clay, medium dense	SP					
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%									
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose				Cohesive Consistency 0-2 Very Soft			
OT=OSTERB. TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense				3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense				16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET		BORING NO.	
SITE LOCATION:					JOB NO.: 60242256		2 of 4	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:	
					N 2969377 E 782517		9.2'	
							Total Depth:	
							71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS	
25	SPT-4	21	11-12	16"	Dry, tan medium to fine SAND, trace gravel and clay, medium dense	SP	<i>Roller bit open hole and sample before advancing casing</i> <i>Casing at 24' bgs</i> <i>Roller bit open hole from 24' to 69' bgs</i>	
30	SPT-5	18	9-9 9-10	15"	Dry, tan medium to fine SAND, trace gravel and clay, medium dense	SP		
35	SPT-6	23	9-12 11-16	14"	Dry, light brown medium to fine SAND, trace gravel and clay, medium dense	SP		
40	SPT-7	33	12-15 18-19	10"	Dry, light brown CLAY, trace gravel, sand, and silt, very stiff	CL	<i>gravel, sand, and silt in CLAY wash</i>	
45	SPT-8	37	15-17 20-20	18"	Moist, brown gray CLAY, trace gravel, sand, and silt, hard	CL		
45	SPT-9	42	13-19	18"	Moist, stratified red coarse SAND, to light brown coarse to fine SAND, trace silt, dense	SP	<i>Roller bit thru gravels</i>	
45					Wet, stratified medium to fine SAND, little silt, and red coarse to fine sand, trace silt, dense	SM to SW		

SAMPLE TYPES:		trace 0 to 5%	SPT Resistance		Approve/Date
SPT=2" SPLIT SPOON	few 5 to 10%				
SS3=3" SPLIT SPOON	little 15 to 25%				
OT=OSTERB. TUBE	some 30 to 45%				
RUN=ROCK CORE	mostly >50%				
		Cohesionless Density:	0-4 Very Loose	Cohesive Consistency	0-2 Very Soft
			5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff
			30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-31	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969377 E 782517		Elevation: 9.2'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-9	42	23-23	18"	Wet, stratified medium to fine SAND, little silt, and red coarse to fine sand, trace silt, dense	SM to SW	<i>SAND wash</i> <i>gravel and sand in CLAY wash</i>			
55	SPT-10	31	20-18 13-36	12"	Moist, olive to light gray CLAY, trace gravel and sand, hard	CL				
60	SPT-11	19	9-10 9-9	24'	Moist, light gray CLAY, very stiff	CL				
65	SPT-12	15	4-6 9-10	24"	Moist, light gray CLAY, stiff	CL	<i>Roller bit thru gravel</i> <i>Roller bit thru gravel</i>			
70	SPT-13	24	7-11 14-17	24"	Dry, light gray CLAY, very stiff	CL				
	SPT-14	35	23-22	16"	Moist, light gray CLAY, fine sand lenses, hard	CL				

SAMPLE TYPES:	trace	0 to 5%	SPT Resistance				Approve/Date	
	SPT=2" SPLIT SPOON	few	5 to 10%					
	SS3=3" SPLIT SPOON	little	15 to 25%					
	OT=OSTERB. TUBE	some	30 to 45%					
RUN=ROCK CORE	mostly	>50%						

Cohesionless Density:		0-4 Very Loose	Cohesive Consistency	0-2 Very Soft
5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-31	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969377 E 782517		9.2'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-14	35	13-11	16"	Moist, light gray CLAY, fine sand lenses, hard		CL			
					End of Boring @ 71.0' bgs					
75										
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose					Cohesive Consistency 0-2 Very Soft	
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense					3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense					16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-31A	
MBTA Right of Way Chelsea, MA				LOCATION:		Elevation:		Total Depth:	
				N 2969395 E 782450		8.8'		71.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/30/2014			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/31/2014			
Hole Size :		Weather :				Ground Water (Depth/Elev.) :			
HW Casing - 4" ID		01/30/14 clear 15 F; 01/31/14 cloudy 28 F				7.9' bgs (1/31/14)			
Drilling Method :				Drilling Fluid :		Top of Rock (Depth) :			
Rotary Wash with Roller Bit				Water		Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
					Dry, roadbed ballast stone and black GRAVEL and SAND, few silt	GW to SW	Air Knife to 4.7' bgs (1/14/14)		
					FILL				
5	SPT-1	31	17-18	5"	Wet, tan SAND, some gravel, few silt, dense	SW			
			13-7						
10	SPT-2	11	8-6	8"	Wet, tan SAND, some gravel, few silt, medium dense	SW	Water @ 7.9' bgs 1/31/14 inside 54' of casing		
			5-6						
15	SPT-3	26	9-13	10"	Wet, tan GRAVEL, some sand, few silt, medium dense	GW			
			13-16						
20	SPT-4	41	10-16	16"	Moist, tan CLAY, trace gravel, sand, and silt, hard	CL			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-31A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969395 E 782450		8.8'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
25	SPT-4	41	25-28	16"	Moist, tan CLAY, trace gravel, sand, and silt, hard	CL	Roller bit thru gravels 27' to 28' bgs sand, clay, and gravel in wash			
30	SPT-5	22	6-9 13-15	24"	Dry, tan to gray CLAY, silt and fine sand lenses, very stiff	CL				
35	SPT-6	33	11-17 16-14	8"	Moist to Wet, stratified tan SAND, little gravel, dense, and tan gray CLAY, trace gravel and sand, hard	SM to CL				
40	SPT-7	33	11-14 19-16	22"	Moist, olive to tan CLAY, trace gravel and fine sand, hard	CL				
45	SPT-8	38	11-17 21-22	21"	Moist to Wet, stratified gray CLAY, trace fine sand, hard, and tan SAND, little silt, dense	CL to SM				
	SPT-9	28	9-12	20"	Moist, gray CLAY, trace gravel, sand, and silt, very stiff	CL				
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
						30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-31A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969395 E 782450		8.8'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-9	28	16-17	24"	Moist gray CLAY, trace gravel, sand, and silt, very stiff	CL	<i>Osterberg tube did not advance, bottom of tube damaged on small gravels</i>			
55	SPT-10	33	10-14 19-24	8"	Moist, gray CLAY, trace gravel and sand, hard	CL				
60	SPT-11	27	8-12 15-19	12"	Moist, gray CLAY, trace gravel and sand, very stiff	CL				
65	SPT-12	14	3-6 8-11	24"	Moist, gray CLAY, trace gravel and sand, stiff	CL				
70	SPT-13	13	2-6 7-8	24"	Moist, gray CLAY, trace gravel and sand, stiff	CL				
70	OT-1		Hyd push	0						
70	SPT-14	13	5-5	24"	Moist, gray stratified fine SAND, few silt, medium dense, and CLAY, stiff	SP to CL				
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-31A	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969395 E 782450		8.8'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-14	13	8-15	24"	Moist, gray CLAY, stiff		CL			
					End of Boring @ 71.0' bgs					
75										
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
						10-29 Med. Dense				
						30-49 Dense	16-30 V-Stiff, 31+ Hard			
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silve Lline Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		1 of 1	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2969416 E 782376		8.2	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 1/31/2014	
DRILL RIG : ATV Mobile B48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 1/31/2014	
Hole Size : 3.25" ID		Weather : 1/31/14 cloudy 40 F				Ground Water (Depth/Elev.) : 9.0' bgs (1/31/14)			
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	Bulk Sample				Dry, black GRAVEL and SAND, few silt	GP to SW	Air Knife to 4' bgs (1/14/14)		
					Dry, tan SAND, some gravel, few silt	SW	Hazmat sample		
							Hazmat sample		
							gravel and sand auger spoil		
10	SPT-1	44	6-17	8"	Dry, tan GRAVEL and SAND, few silt and clay, dense	GW to SW	Auger plug dry at 6' bgs		
			27-29				gravelly sand auger spoil		
							Auger plug wet at 9' bgs		
15	SPT-2	11	4-6	5"	Wet, tan GRAVEL and fine SAND, few silt, medium dense	GW to SW			
			5-4						
					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose						
ST=SHELBY TUBE		some 30 to 45%	Cohesive Consistency 0-2 Very Soft						
RUN=ROCK CORE		mostly >50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
			5-9 Loose 10-29 Med. Dense						
			30-49 Dense 50+ Very Dense						
			16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-33	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969417 E 782241		Elevation: 14.3'		Total Depth: 81.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN:		12/6/2013	
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED :		12/10/2013	
Hole Size : HW Casing - 4" ID		Weather : 12/6/13 drizzle 48F, 12/9/13 rain 44F, 12/10/13 cloudy 36F				Ground Water (Depth/Elev.) : 8' bgs (12/9/13) in 54' casing			
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
					topsoil				
					Dry, black to brown GRAVEL and SAND, little silt	GM to SM			
	SPT-1	21	7-8	8"	Dry, tan fine GRAVEL and medium to fine SAND, some silt, medium dense	GM to SM	Resistivity= 11,363 ohm-cm Chloride and Sulfate not detected pH= 5.9 (distilled water)		
			13-12						
5	SPT-2	19	6-7	16"	Dry, tan fine SAND, little silt, trace clay, medium dense	SM			
			12-14		FILL				
							clay wash		
10	SPT-3	19	6-7	24"	Dry, tan CLAY, few silt, trace gravel, very stiff	CL			
			12-14						
15	SPT-4	16	4-5	24"	Wet, tan stratified CLAY, few silt, very stiff, and fine SAND, little silt, trace clay, medium dense	CL to SM			
			11-18						
20	SPT-5	17	4-6	24"	Moist, tan CLAY, few silt, very stiff	CL			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose				Cohesive Consistency 0-2 Very Soft	
OT=OSTERB. TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense				3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense				16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-33	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969417 E 782241		14.3'		81.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-5	17	11-11	24"	Wet, tan CLAY, few silt, very stiff		CL	sand in silt wash		
30	SPT-6	8	3-3 5-6	15"	Wet, tan SILT, some fine sand, loose		ML			
35	SPT-7	12	4-6 6-7	12"	Wet, tan SILT, some fine sand, medium dense		ML			
40	SPT-8	6	4-3 3-4	14"	Wet, brown olive SAND, little silt, loose		SM			
45	SPT-9	8	1-4 4-4	20"	Wet, olive stratified fine SAND, little silt, trace clay, and fine SAND, little clay, trace silt, loose		SM to SC			
	SPT-10	11	3-5	8"	Wet, tan SAND, trace silt, medium dense		SW			
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET		BORING NO.	
SITE LOCATION:					JOB NO.: 60242256		3 of 4	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:	
					N 2969417 E 782241		14.3'	
Total Depth:		81.0'						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS	
50	SPT-10	11	6-7	8"	Wet, tan SAND, trace silt, medium dense	SW	<i>drilling thru gravels</i> <i>drilling thru gravels</i> <i>bottom casing (12/6/13) START to Roller Bit ahead of casing drive (12/9/13)</i> <i>silty sand and fine gravel in wash</i> <i>silty sand and fine gravel in wash</i> <i>silty sand and fine gravel in wash</i>	
55	SPT-11	8	7-4 4-5	6"	Wet, tan SAND, little silt, few gravel, loose	SM		
60	SPT-12	48	3-15 33-30	10"	Wet, tan GRAVEL, some sand, little silt, trace clay, dense	GM		
65	SPT-13	96	21-53 43-26	8"	Wet, gray-brown GRAVEL, some sand, little silt, very dense	GM		
70	SPT-14	70	27-36 34-22	10"	Wet, brown GRAVEL, some sand, little silt, very dense	GM		
	SPT-15	48	19-23	6"	Wet, brown GRAVEL, some sand, little silt, dense	GM		
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
OT=OSTERB. TUBE		some	30 to 45%					
RUN=ROCK CORE		mostly	>50%					
				Cohesionless Density:		Cohesive Consistency		
				0-4 Very Loose		0-2 Very Soft		
				5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
				30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard		

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GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-34	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969456 E 782154		Elevation: 9.2'		Total Depth: 22.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 2/3/2014			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 2/3/2014			
Hole Size : 3.25" ID		Weather : 02/03/14 cloudy 34 F				Ground Water (Depth/Elev.) : 5' bgs (12/20/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Moist, black SAND, some gravel, little silt	SM	Air Knife to 6' bgs (12/20/14) Hazmat sample Hazmat sample		
					FILL				
					Moist, brown SAND, some gravel, little silt	SM			
10	SPT-1	18	4-7 11-15	24"	Dry, tan CLAY, trace gravel, sand, and silt, very stiff	CL			
	SPT-2	16	4-7 9-11	24"	Dry, tan CLAY, trace silt, very stiff	CL			
15									
	SPT-3	11	3-5 6-9	24"	Dry, tan CLAY, trace silt, stiff	CL			
20					Dry, tan CLAY, trace silt, very soft	CL			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
OT=OSTERB. TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-34	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969456 E 782154		9.2'		22.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-4	4	woh/12"	14"	Dry, tan CLAY, trace silt, very soft		CL			
			4-3		Wet, tan fine SAND, little silt, trace clay, loose		SM			
25					End of Boring @ 22.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		1 of 2	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2969523 E 781962		8.7'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 2/3/2014	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 2/3/2014	
Hole Size : 3.25" ID		Weather : 02/03/14 cloudy 34 F				Ground Water (Depth/Elev.) : Measured @ 4.0'bgs (2/22/14)			
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					asphalt pavement		Air Knife to 6' bgs (12/20/14) FILL Hazmat sample Hazmat sample		
					Moist, black SAND, little gravel and silt	SM			
					FILL				
					Moist, light brown SAND, little gravel and silt	SM			
10	SPT-1	4	woh-2 2-3	18"	Moist, blue gray CLAY, trace silt, soft	CL	after SPT-2, push 3" spoon to 12' bgs, 18" recovery		
15	SPT-2	18	6-8 10-10	0	Dry, gray CLAY, trace silt, very stiff	CL			
					Dry, olive CLAY, trace silt, very stiff				
20	SPT-3	16	4-6 10-11	24"	Dry, olive CLAY, silt and fine sand lenses, very stiff	CL	fine sand and silt in CLAY wash		
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose						
OT=OSTERB. TUBE		some 30 to 45%	Cohesive Consistency 0-2 Very Soft						
RUN=ROCK CORE		mostly >50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
			5-9 Loose 10-29 Med. Dense						
			30-49 Dense 50+ Very Dense						
			16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256		2 of 2		B-35	
					LOCATION: N 2969523 E 781962		Elevation: 8.7'		Total Depth: 22.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
	SPT-4	3	2-2	24"	Moist, olive to light gray CLAY, soft	CL				
			1-2							
25					End of Boring @ 22.0' bgs		Monitoring well set : PVC screen from 10' to 20' bgs, bentonite seal 3' to 4' bgs 2/07/14 - well bailed to 17' bgs, recovered to 6.6' after 72 hrs			
30										
35										
40										
45										

SAMPLE TYPES:		trace 0 to 5%	SPT Resistance		Approve/Date
SPT=2" SPLIT SPOON		few 5 to 10%			
SS3=3" SPLIT SPOON		little 15 to 25%			
OT=OSTERB. TUBE		some 30 to 45%			
RUN=ROCK CORE		mostly >50%			
			Cohesionless Density:	0-4 Very Loose	Cohesive Consistency 0-2 Very Soft
			5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff
			30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-36	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969500 E 781909		9.4'		74.0	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
25	SPT-5	12	7-9	12'	Dry, olive brown CLAY, stiff, with silt and fine sand lenses, 2" to 6" spacing		CL	Moisture content 24.1%		
								Roller bit open hole to 74' bgs		
30	SPT-6	5	2-2 3-3	24"	Dry, gray tan CLAY, loose, with silt and fine sand lenses, 6" or greater spacing		CL			
35	SPT-7	6	2-2 4-7	20"	Dry, olive stratified CLAY, medium stiff, with fine sand, little silt, loose		CL to SM	Moisture content 21.8%		
40	SPT-8	5	2-2 3-2	0	Moist, light gray CLAY, medium stiff, with silt and fine sand lenses, 4" spacing		CL	after SPT-8, pushed 3" spoon from 34' to 36', 22" recovery		
45	SPT-9	3	2-1 2-2	24"	Moist, olive CLAY, soft, with silt and fine sand lenses, 6" or greater spacing		CL	Moisture content 30.6% Plastic limit 19, Liquid limit 41, Plastic index 22		
	SPT-10	5	2-2	24	Moist, olive CLAY, medium stiff, with silt and fine sand lenses, 2" spacing		CL			

SAMPLE TYPES:		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON	trace 0 to 5%						
SS3=3" SPLIT SPOON	few 5 to 10%						
OT=OSTERB. TUBE	little 15 to 25%						
RUN=ROCK CORE	some 30 to 45%						
	mostly >50%	30-49 Dense	50+ Very Dense				

Cohesionless Density:		Cohesive Consistency	
0-4 Very Loose	10-29 Med. Dense	0-2 Very Soft	9-15 Stiff
5-9 Loose	30-49 Dense	3-4 Soft	16-30 V-Stiff, 31+ Hard

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-36	
MBTA Right of Way Chelsea, MA					LOCATION: N 2969500 E 781909		Elevation: 9.4'		Total Depth: 74.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-10	5	3-4	24"	Moist, olive CLAY, medium stiff, with silt and fine sand lenses, 2" spacing	CL	Roller bit open hole to 74' bgs gravel driven thru SPT sample			
55	SPT-11	6	3-4 2-5	24"	Moist, olive stratified, 3" CLAY, medium stiff, and 1" to 2" fine sand, little silt, loose Wet, fine sand, little silt, loose	CL to SM SM				
60	SPT-12	3	1-2 1-3	24"	Moist, olive CLAY, soft, with silt and fine sand lenses	CL				
65	SPT-13	1	woh/16" 1-3	24"	Moist, olive CLAY, very soft, with silt and fine sand lenses	CL				
70					End of Sampling @ 61'bgs continue to Roller bit open hole to sand and gravel wash gray clay wash, trace fine sand	CL wash	11:00 Roller Bit ahead			

SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
OT=OSTERB. TUBE		some	30 to 45%					
RUN=ROCK CORE		mostly	>50%					
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency	0-2 Very Soft
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard	

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GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-37	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969574 E 781741		Elevation: 8.7		Total Depth: 12.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN:		1/8/2014	
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED :		1/8/2014	
Hole Size : 3.25" ID		Weather : 1/08/14 clear 20 F				Ground Water (Depth/Elev.) : 4.0' bgs (12/30/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	Bulk Sample				Dry, ballast stone and black SAND, some gravel, few silt	SW	<i>Air Knife to 6' bgs (12/30/13)</i> <i>Hazmat sample</i> <i>gravel 40%, sand 49.2%, fines 10.8%</i> <i>Hazmat sample</i> <i>water at 4' bgs (12/30/13)</i>		
					FILL				
					Wet, tan SAND, some gravel, few silt				
10	SPT-1	15	9-8	10"	Wet, brown-black GRAVEL and SAND and WOOD, little silt, medium dense	GM to SM	<i>Wood in auger spoil (buried tree limbs)</i> <i>brown to black gravel, sand, silt, and wood in auger spoil</i> <i>[adjacent to Rte 1 overpass bridge abutment]</i>		
			7-6						
15	SPT-2	3	6-2	5"	Wet, dark brown PEAT, little sand, trace silt, soft	PT			
			1-1						
					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
ST=SHELBY TUBE		some 30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly >50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:						JOB NO.: 60242256		1 of 1		B-38	
MBTA Right of Way Chelsea, MA						LOCATION: N 2969659 E 781488		Elevation: 8.0'		Total Depth: 12.0	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN:		1/8/2014	
DRILL RIG : ATV Mobile B48, Auto Hammer						DRILLER : Tim Tucker		FINISHED :		1/8/2014	
Hole Size : 3.25" ID			Weather : 1/8/14 clear 20 F				Ground Water (Depth/Elev.) : 5.0' bgs (1/8/14)				
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5	Bulk Sample				Dry, ballast stone and black GRAVEL and SAND, little silt	GP to SM	Air Knife to 6' bgs (12/20/13)				
					FILL						
					Wet, light brown to tan GRAVEL and SAND, little silt	GM to SM	Hazmat sample water at 3' bgs (12/20/13) Hazmat sample				
							SPT wet at 5' bgs (1/8/14)				
10	SPT-1	19	5-9 10-7	10"	Wet, brown to gray GRAVEL and SAND, little silt, clay, medium dense	GM to SM	Roller bit thru gravels				
							brown sand and peat in wash				
15	SPT-2	5	11-3 2-3	18"	Wet, brown PEAT, medium stiff	PT	moisture content 193%, organic content 32.6%, sand 85.9%, fines 14.1%				
					End of Boring @ 12.0' bgs						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%								
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency: 0-2 Very Soft							
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-39	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969712 E 781275		Elevation: 7.6'		Total Depth: 22.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/8/2014			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/8/2014			
Hole Size : 3.25" ID		Weather : 1/8/14 clear 15 F				Ground Water (Depth/Elev.) : 6' bgs (1/8/14)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	BULK SAMPLE				Dry, Ballast stone and black GRAVEL and SAND, few silt	GW to SW	Air Knife to 6' bgs (12/20/14) Moisture content 6% gravel 51%, sand 43.7%, fines 5.3%		
					FILL				
					Dry to Moist, tan GRAVEL and SAND, few silt	GW to SW			
10	SPT-1	9	1-6	3"	Moist, light gray CLAY, trace gravel and sand, stiff	CL	brown peat wash		
			3-2						
	SPT-2	2	woh/12"	21"	Wet, brown PEAT, few sand and silt, very soft	PT			
			2-2		Moist, blue gray CLAY, trace peat, very soft	CH			
15	SPT-3	25	8-10	19"	Dry, gray brown CLAY, very stiff	CL			
			15-16						
20									
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-39	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969712 E 781275		7.6'		22.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-4	17	5-8 9-10	22"	Dry, olive CLAY, very stiff		CL			
25					End of Boring @ 22.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-40		
MBTA Right of Way Chelsea, MA				LOCATION: N 2969793 E 780964		Elevation: 7.4'		Total Depth: 12.0		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/8/2014				
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/8/2014				
Hole Size : 3.25" ID		Weather : 1/8/14 clear 10 F				Ground Water (Depth/Elev.) : 6' bgs (1/08/14)				
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5	BULK SAMPLE				Dry, Ballast stone and black GRAVEL and SAND, little silt	GW to SW	Air Knife to 6' bgs (12/20/14)			
					FILL					
					Dry light brown GRAVEL and SAND, little silt	GM to SM				
10	SPT-1	20	7-13	8"	Wet, olive brown GRAVEL and SAND, little silt, medium dense	GM to SM				
			7-4							
15	SPT-2	4	7-3	16"	Wet, brown PEAT, soft	PT				
			1-2							
20					End of Boring @ 12.0' bgs					
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date			
SPT=2" SPLIT SPOON		few 5 to 10%								
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft							
OT=OSTERB. TUBE		some 30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly >50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		1 of 2	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2969853 E 780749		8.3'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 1/8/2014	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 1/8/2014	
Hole Size : 3.25" ID		Weather : 01/08/14 clear 8 F				Ground Water (Depth/Elev.) : Measured @ 3.4' bgs (2/22/14)			
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	BULK sample				Dry, roadbed ballast stone and black SAND, some gravel, few silt	SP	Air Knife to 6' bgs (12/20/14)		
					FILL		Hazmat sample		
					Dry, tan SAND, some gravel, few silt	SP	Hazmat sample		
							gravel 41.3%, sand 53.2%, fines 5.5%		
10	SPT-1	15	8-9	10"	Wet, brown SAND, some gravel, little silt, medium dense	SM	water at 5' (12/20/13)		
			6-3						
15	SPT-2	2	woh/12"	22"	Moist, dark brown PEAT, very soft	PT			
			2-1						
20	SPT-3	15	1-6	21"	Dry, olive CLAY, stiff	CL			
			9-12						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose		Cohesive Consistency 0-2 Very Soft			
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.					
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256		2 of 2		B-41				
					LOCATION: N 2969853 E 780749		Elevation: 8.3'		Total Depth: 22.0'				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS						
	SPT-4	7	2-3	21"	Moist, olive CLAY, loose	CL							
			4-5										
25					End of Boring @ 22.0' bgs		Monitoring well set : PVC screen from 10' to 20' bgs, bentonite seal 2' to 4' bgs						
30													
35													
40													
45													
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date					
SPT=2" SPLIT SPOON		few	5 to 10%										
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose							Cohesive Consistency 0-2 Very Soft		
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense							3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense							16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 3		B-42	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969849 E 780631		Elevation: 10.8'		Total Depth: 61.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/5/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/5/2013			
Hole Size : HW Casing - 4" ID		Weather : 12/5/13 cloudy 40 F				Ground Water (Depth/Elev.) : 5' bgs (12/5/13)			
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	SPT-1	2	9-1	4"	3" Asphalt pavement Dry brown to black GRAVEL and SAND, little silt, loose FILL Wet, brown GRAVEL and SAND, little silt, red brick chips and ash, loose	GM to SM	brown gravel and sand in wash after SPT-2, pushed 3" spoon from 4' to 6', 6" recovery red brick chips in wash water lost during casing washout		
			1-1						
	SPT-2	6	5-2	2"					
			4-4						
	10	SPT-3	1	1/24"					
SPT-4		7	1/10"-1	12"					
			6-9						
15		SPT-5	11	3-5	22"	Dry, olive CLAY, stiff	CL	Moisture content 33.8%	
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
ST= SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET		BORING NO.	
SITE LOCATION:					JOB NO.: 60242256		2 of 3	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:	
					N 2969849 E 780631		10.8'	
Total Depth:		61.0						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS	
25	SPT-5	11	6-7	22"	Moist, olive CLAY, stiff	CL	Moisture content 33.8%	
30	SPT-6	5	2-2 3-4	22"	Moist, olive CLAY, trace gray clay, medium stiff	CL	Moisture content 36.5%	
35	SPT-7	1	woh/18" 2	24"	Moist, olive CLAY, very soft	CL		
40	ST-4	-	mech push	20"				
45	SPT-8	1	woh/24"	24"	Moist, olive CLAY, silt and fine sand lenses every 4", very soft	CL		
45	SPT-9	1	woh/18" 1	24"	Moist, olive CLAY, very soft	CL	Moisture content 37.6% Plastic limit 23, Liquid limit 50, Plastic index 27	
	SPT-10	1	woh/24"	24"	Moist, olive CLAY, very soft	CL		
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
ST= SHELBY TUBE		some	30 to 45%					
RUN=ROCK CORE		mostly	>50%					
				Cohesionless Density:		Cohesive Consistency		
				0-4 Very Loose		0-2 Very Soft		
				5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
				30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 3		B-42	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969849 E 780631		10.8'		61.0	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
50	SPT-10	1	woh/24"	24"	Moist, olive gray CLAY, very soft	CL	after ST-5, pushed SPT from 49' to 51', 24" recovery Moisture content 38%			
55	ST-5	-	Mech push	0	Moist, olive gray CLAY, very soft	CL				
60	SPT-11	1	woh/18" 2	24"	Moist, olive CLAY, very soft	CL				
65	ST-6	-	Mech push	0	Moist, olive CLAY, very soft	CL	after ST-6, pushed SPT from 59' to 61', 24" recovery Moisture content 33.6%			
70					End of Boring @ 61' bgs		Bentonite and cement Grout placed from 0.5' to 61' bgs, asphalt cold patch set 0' to 0.5'			
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
ST= SHELBY TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION: MBTA Right of Way Chelsea, MA						JOB NO.: 60242256		1 of 1		B-43	
						LOCATION: N 2969908 E 780502		Elevation: 7.9		Total Depth: 9.1	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN:		1/7/2014	
DRILL RIG : ATV Mobile B48, Auto Hammer						DRILLER : Tim Tucker		FINISHED :		1/7/2014	
Hole Size : 3.25" ID		Weather : 1/07/14 cloudy 10 F				Ground Water (Depth/Elev.) : 6.0' bgs (1/07/14)					
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5					Dry, ballast stone and black GRAVEL and SAND, little silt and roots	GM to SM	Air Knife to 6' bgs (12/19/13) Hazmat sample Hazmat sample brown gravel and silt in SAND auger spoil brown gravel and silt in SAND auger spoil gravel in SPT tip				
					FILL						
					Dry, brown SAND, some gravel, little silt						
					Moist, brown SAND, some gravel, little silt, medium dense						
					SPT and Auger Refusal						
10	SPT-1	28	6-11 17-28	6"		SM					
	SPT-2	100	100/1"	1"		SM					
15					End of Boring @ 9.1' bgs						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%								
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft							
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-44		
MBTA Right of Way Chelsea, MA				LOCATION: N 2969940 E 780363		Elevation: 8.1'		Total Depth: 12.0'		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/17/2013				
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/17/2013				
Hole Size : 3"		Weather : 12/17/13 partly cloudy 15 F				Ground Water (Depth/Elev.) : 5' bgs (12/17/13)				
Drilling Method : Open hole - drive 3" spoon				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5	BULK SAMPLE				Dry, topsoil, ballast stone, and dark brown GRAVEL and SAND, little silt	GM to SM	Air Knife to 6' bgs (12/17/13) Creosote odor from soil spoil			
10	SPT-1	16	7-11	12	Wet, black to brown SAND, little gravel, few silt and clay, medium dense	SW	Moisture content 44% gravel 20.5%, sand 63.5%, fines 16% Plastic limit 44, Liquid limit 76, Plastic index 32			
			5-2		Moist, brown PEAT, with sand and clay, soft	PT				
	SPT-2	21	4-11	12"	Dry, olive gray CLAY, trace peat, medium dense	CL				
			10-20							
15					End of Boring @ 12' bgs					
20										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft						
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-45	
MBTA Right of Way Chelsea, MA				LOCATION:		Elevation:		Total Depth:	
				N 2969879 E 779340		11.7'		21.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/11/2013			
DRILL RIG : Mobile B-49 Truck				DRILLER : Tim Tucker		FINISHED : 12/11/2013			
Hole Size : HW Casing - 4" ID		Weather : 12/11/13 partly cloudy 30 F				Ground Water (Depth/Elev.) : 5' bgs (12/11/13)			
Drilling Method : Rotary wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, topsoil		<i>wet soil sample</i> <i>black sand and gravel wash</i> <i>brown peat in wash</i>		
					Dry, brown SAND, little gravel and silt	SM			
	SPT-1	53	11-13	16"	Dry, brown to black SAND, little gravel and silt, very dense	SM			
			40-44		Dry, tan medium to fine SAND, trace gravel and silt, very dense				
	SPT-2	69	45-35	10"	Dry, black to brown SAND, little gravel and silt, very dense	SM			
			34-19		FILL				
	SPT-3	32	15-9	4"	Wet, brown SAND, little gravel and silt, dense	SM			
			23-28						
	SPT-4	7	5-5	4"	Wet, black GRAVEL and SAND, little silt, loose	SM			
			2-3						
10									
15	SPT-5	3	4-1	10"	Wet, brown PEAT, some sand and clay, very soft	PT			
			2-4		Wet, blue gray CLAY, little peat, soft	CH			
20									
	SPT-6	33	12-15	20"	Moist, olive CLAY, trace sand, silt, and peat, hard	CL			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-45	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969879 E 779340		11.7'		21.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-6	33	18-25	20"	Moist, olive CLAY, trace sand, silt, peat, hard		CL			
25					End of Boring @ 21.0' bgs			Bentonite and cement Grout placed from 0' to 21' bgs		
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some	30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly	>50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-46	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969960 E 780291		Elevation: 7.6'		Total Depth: 22.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/30/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/30/2013			
Hole Size : 3.25" ID		Weather : 12/30/13 cloudy 45 F				Ground Water (Depth/Elev.) : 4' bgs (12/30/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : WATER		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, ballast stone and black GRAVEL and SAND, little silt	GM to SM	<i>Air Knife to 6' bgs (12/19/13)</i> <i>Hazmat sample</i> <i>Hazmat sample</i> <i>brown gravel, sand, silt, and peat in auger spoil</i>		
					FILL				
10	SPT-1	0	woh/24"	22"	Wet, black to brown GRAVEL and SAND, little silt, trace peat	PT			
15	SPT-2	23	4-9 14-15	24"	Wet, brown PEAT, very soft	OH			
					Moist, blue gray CLAY, trace peat, stiff	CL			
					Dry, light gray brown CLAY, trace silt, very stiff				
						CL			
	SPT-3	14	3-6 8-11	24"	Dry, olive CLAY, stiff				
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-46	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969960 E 780291		7.6'		22.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
	SPT-4	8	1-4 4-7	24"	Moist, olive CLAY, medium stiff		CL			
25					End of Boring @ 22.0' bgs					
30										
35										
40										
45										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 5		B-47	
MBTA Right of Way Chelsea, MA				LOCATION: N 2969928 E 780259		Elevation: 9.8'		Total Depth: 109.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/11/2013			
DRILL RIG : Mobile B-59, Truck				DRILLER : Wayne Tucker, Tim Tucker		FINISHED : 12/18/2013			
Hole Size : 5" to 3"ID		Weather : 12/11/13 partly cloudy 30F, 12/12/13 clear 24F, 12/13/13 cloudy 28F, 12/16/13 clear 27F, 12/18/13 cloudy 28F				Ground Water (Depth/Elev.) : 9' bgs (12/13/13)			
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Grass, topsoil and roots	SW	black gravel and sand wash brown, gravel and sand wash after SPT-3, pushed 3" spoon from 9' to 11'; no recovery brown peat and gray clay wash gray clay wash		
					Dry, brown SAND, little fine gravel, few silt				
	SPT-1	41	26-21	12"	FILL Dry, black GRAVEL and SAND, little silt, red brick chips, medium dense	GM to SM			
			20-9						
	SPT-2	17	19-8	9"					
10					No Recovery		brown peat and gray clay wash gray clay wash		
	SPT-3	5	9-3	0					
			2-2						
15					Moist, olive CLAY, hard	CL	Moisture content 25.7%		
	SPT-4	47	17-22	16"					
			25-33						
20					Moist, olive CLAY, stiff	CL	Moisture content 33.5%		
	SPT-5	14	4-6	24"					
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
OT=OSTERB. TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET 2 of 5		BORING NO. B-47	
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256		Elevation: 9.8'	
					LOCATION: N 2969928 E 780259		Total Depth: 109.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS	
25	SPT-5	14	8-10	24"	Moist, olive CLAY, stiff	CL	Moisture content 33.5%	
	Shelby Tube	-	Mech push	0			40 minute Hold after push, no recovery	
	OT-1	-	Hyd push	15"	Moist, olive CLAY	CL	bottom PW Casing 5"ID (12/12/13) moisture content 34%, Plastic limit 21, Liquid limit 48, Plastic index 27	
30							Roller bit open hole from 24' to 89' (12/12/13 and 12/13/13)	
	OT-2	-	Hyd push	23.5"	Moist, olive CLAY	CL		
35								
	OT-3	-	Hyd push	24"	Moist, olive CLAY	CL	Moisture content 37.3%	
40								
	OT-4	-	Hyd push	0	Moist, olive CLAY	CL	after OT-4, pushed 3" spoon from 39' to 41', 24" recovery	
45								
	OT-5	-	Hyd push	24"	Moist, olive CLAY	CL	Moisture content 43.8%	
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
OT= OSTERB. TUBE		some	30 to 45%					
RUN=ROCK CORE		mostly	>50%					
				Cohesionless Density:		Cohesive Consistency		
				0-4 Very Loose		0-2 Very Soft		
				5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
				30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET		BORING NO.	
SITE LOCATION:					JOB NO.: 60242256		3 of 5	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:	
					N 2969928 E 780259		9.8'	
Total Depth:		109.0'						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS	
	OT-5	-	Hyd push	24"	Moist, olive CLAY	CL	Moisture content 43.8%	
50	OT-6	-	Hyd push	24"	Moist, olive CLAY,	CL		
55	SPT-6	0	woh/24"	24"	Moist, olive CLAY, very soft	CL		
60	OT-7	-	Hyd push	24"	Moist, olive CLAY	CL	moisture content 31%, Plastic limit 16, Liquid limit 30, Plastic index 14	
65	SPT-7	0	woh/24"	24"	Moist, olive CLAY, very soft	CL		
70	OT-8	-	Hyd push	24"	Moist, olive CLAY	CL		
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
OT=OSTERB. TUBE		some	30 to 45%					
RUN=ROCK CORE		mostly	>50%					
				Cohesionless Density:		Cohesive Consistency		
				0-4 Very Loose		0-2 Very Soft		
				5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
				30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET		BORING NO.	
SITE LOCATION:					JOB NO.: 60242256		4 of 5	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:	
					N 2969928 E 780259		9.8'	
Total Depth:		109.0'						

Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS
71	OT-8	-	Hyd push	24"	Moist, olive CLAY		
75	SPT-8	0	woh/24"	24"	Moist, olive CLAY, very soft		
80	OT-9	-	Hyd push	23"	Moist, olive CLAY		Moisture content 29.8%
85	SPT-9	0	woh/24"	24"	Moist, olive CLAY, trace silt lenses, very soft		
90	OT-10	-	hyd push	0			
	SPT-10	78	38-40	14"	Moist, olive SAND, some silt, few gravel, very dense	SM	bottom boring (12/13/13)
95	SPT-11	39	16-12	12"	Wet, olive GRAVEL and SAND, little silt, dense	GM to SM	set NW casing to 94' (12/16/13)

SAMPLE TYPES:		trace	0 to 5%	SPT Resistance		Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%			
SS3=3" SPLIT SPOON		little	15 to 25%			
OT=OSTERB. TUBE		some	30 to 45%			
RUN=ROCK CORE		mostly	>50%			

Cohesionless Density:		0-4 Very Loose	Cohesive Consistency	0-2 Very Soft
5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		5 of 5		B-47	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2969928 E 780259		9.8'		109.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery or REC & RQD	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
100	SPT-11	39	27-43	12"	Wet, olive GRAVEL and SAND, little silt, dense		GM to SM			
100	SPT-12	174	46-74 100/4"	10"	Wet, olive SAND, little gravel, silt, and clay, very dense		SM	NW Casing set to 100.5'		
105	RUN 1		7 min	Rec=59" RQD=62%	Cambridge Argillite [Gray]			Axial Compression test 4339 psi Bulk density 168 pcf		
			5.5 min							
			4 min							
			3.75 min							
110			4 min							
115					End of Boring @ 109' bgs					
120										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-48		
MBTA Right of Way Chelsea, MA				LOCATION: N 2970007 E 780140		Elevation: 7.9'		Total Depth: 71.0'		
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN:		12/23/2013		
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Wayne Tucker, Tim Tucker		FINISHED :		12/26/2013		
Hole Size : HW Casing - 4" ID		Weather : 12/23/13 rain 32 F, 12/26/13 cloudy 25 F				Ground Water (Depth/Elev.) : Measured @ 4.7' bgs (2/22/14)				
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
5	BULK SAMPLE				Dry, roadbed ballast stone and black GRAVEL and SAND, few silt, railroad spikes	GW to SW	<i>Air Knife to 6'bgs (12/17/13)</i> <i>Moisture content 4.9% gravel 52.5%, sand 39.6%, fines 7.9%</i>			
					FILL					
					Dry, light brown SAND, little gravel and trace silt	SW				
					Moist to wet, light brown SAND, little gravel and clay	SC				
10	SPT-1	15	12-6	10"	Wet, light brown SAND, little gravel and silt, light brown CLAY layer, medium dense	SM	<i>after SPT-2, pushed 3" spoon from 9' to 11', no recovery light brown sand, few gravel and silt wash</i>			
			9-7							
		SPT-2	9	7-7						0
				2-1						
15	SPT-3	20	4-10	10"	Moist, brown olive CLAY, trace fine sand and silt, very stiff	CL	<i>Casing (12/17/13) cleanout and SPT-3 (12/23/13)</i> <i>Roller Bit open hole from 14' to 69'bgs</i>			
			10-10							
		SPT-4	6	2-2						24"
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%		Cohesionless Density: 0-4 Very Loose		Cohesive Consistency 0-2 Very Soft			
OT=OSTERB. TUBE		some	30 to 45%		5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
RUN=ROCK CORE		mostly	>50%		30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-48	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2970007 E 780140		7.9'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
25	SPT-4	6	4-4	24"	Moist, olive gray CLAY, medium stiff	CL				
30	SPT-5	5	2-2 3-2	8"	Moist, olive CLAY, medium stiff	CL				
35	SPT-6	0	woh/24"	24"	Moist, olive CLAY, very soft	CL				
40	OT-1	0	Hyd push	23"	Moist, olive CLAY, very soft	CL				
45	SPT-7	0	woh/24"	24"	Moist, olive CLAY, very soft	CL				
	SPT-8	0	woh/24"	24"	Moist, olive CLAY, very soft	CL				

SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few 5 to 10%					
SS3=3" SPLIT SPOON		little 15 to 25%					
OT=OSTERB. TUBE		some 30 to 45%	Cohesionless Density:		Cohesive Consistency		
RUN=ROCK CORE		mostly >50%	30-49 Dense 50+ Very Dense		0-2 Very Soft		
			5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
					16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.								
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-48							
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:							
					N 2970007 E 780140		7.9'		71.0'							
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS								
50	SPT-8	0	woh/24"	24"	Moist, olive CLAY, very soft		CL	<i>after SPT-10, pushed 3" spoon from 54' to 56', 24" recovery</i>								
55	SPT-9	0	woh/24"	24"	Moist, olive CLAY, very soft		CL									
60	SPT-10	7	2-3	0	Moist, olive CLAY, silt and fine sand lenses, medium stiff		CL									
			4-4													
65	SPT-11	0	woh/24"	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL									
70	SPT-12	0	woh/24"	24"	Moist, olive CLAY, very soft		CL									
70	SPT-13	0	woh/22"	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL									
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date							
SPT=2" SPLIT SPOON		few	5 to 10%													
SS3=3" SPLIT SPOON		little	15 to 25%													
OT=OSTERB. TUBE		some	30 to 45%													
RUN=ROCK CORE		mostly	>50%													
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft							
						5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff								
						30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard								

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GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION: MBTA Right of Way Chelsea, MA						JOB NO.: 60242256		1 of 4	
						LOCATION: N 2970051 E 780153		Elevation: 7.3'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 12/26/2013	
DRILL RIG : ATV Mobile B-48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 12/27/2013	
Hole Size : HW Casing - 4" ID		Weather : 12/26/13 cloudy 34 F, 12/27/13 cloudy 25 F				Ground Water (Depth/Elev.) : 4' bgs (12/26/13)			
Drilling Method : Rotary Wash with Roller Bit						Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, roadbed ballast stone and black GRAVEL and SAND, little silt	GM to SM	Air Knife to 6'bgs (12/19/13) 3" Roller bit and HW Casing 4" Roller bit, Casing refusal Casing removed, 5" Roller bit to 9' thru gravels and cobbles, brown peat and wood in wash HW Casing to 9' bgs after SPT-1, pushed 3" spoon from 9' to 11', 12" recovery casing pushed to 13' bgs driven to 14' bgs wood pushed into SPT sample		
					FILL				
10	SPT-1	2	2-1 1-1	0	Moist, light brown GRAVEL and SAND, little silt	GM to SM			
15	SPT-1	2	2-1 1-1	0	Wet, dark olive CLAY, little peat, trace sand and silt, very soft	CL			
15	OT-1	-	Hyd push	9"	Dry, olive CLAY, trace silt and wood, medium dense	CL			
15	SPT-2	13	3-5-8-9	24"		CL			
20	SPT-3	6	2-2	24"	Moist, olive CLAY, trace silt, loose	CL			
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose						
OT=OSTERB. TUBE		some 30 to 45%	Cohesive Consistency 0-2 Very Soft						
RUN=ROCK CORE		mostly >50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
			5-9 Loose 10-29 Med. Dense						
			30-49 Dense 50+ Very Dense						
			16-30 V-Stiff, 31+ Hard						

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-49	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2970051 E 780153		7.3'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
25	SPT-3	6	4-4	24"	Moist, olive CLAY, trace silt, medium stiff	CL				
30	SPT-4	0	woh/22" 2	24"	Moist, olive CLAY, very soft	CL				
35	SPT-5	0	woh/20" 2	24"	Moist, olive CLAY, very soft	CL				
40	SPT-6	0	woh/18" 3	24"	Moist, olive CLAY, very soft	CL				
45	SPT-7	0	woh/23" 1	23"	Moist, olive CLAY, fine sand lens, very soft	CL				
	SPT-8	0	woh/20"	24"	Moist, olive CLAY, very soft	CL				
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
				5-9 Loose		10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
				30-49 Dense		50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-49	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2970051 E 780153		7.3'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
50	SPT-8	0	2	24"	Moist, olive CLAY, very soft		CL			
55	SPT-9	0	woh/23" 1	24"	Moist, olive CLAY, very soft		CL			
60	SPT-10	0	woh/24"	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL			
65	SPT-11	0	woh/24"	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL			
70	SPT-12	0	woh/20" 1	24"	Moist, olive CLAY, very soft		CL			
	SPT-13	0	woh/18"	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL			
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency	0-2 Very Soft
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	

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GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-50			
MBTA Right of Way Chelsea, MA				LOCATION: N 2970073 E 780070		Elevation: 7.0'		Total Depth: 84.0'			
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/27/2013					
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/30/2013					
Hole Size : HW Casing - 4" ID		Weather : 12/27/13 cloudy 30 F, 12/30/13 cloudy 30 F				Ground Water (Depth/Elev.) : 6' bgs (12/27/13)					
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered					
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5	BULK SAMPLE				Dry, roadbed ballast stone and black GRAVEL and SAND, little silt	GM to SM	<i>Air Knife to 6'bgs (12/19/13)</i> <i>Resistivity= 30,991 ohm-cm</i> <i>Chloride and Sulfate not detected,</i> <i>pH= 5.0 (distilled water)</i>				
					FILL						
10	SPT-1	0	woh/18"	18"	Moist, light brown GRAVEL and SAND, little silt	GM to SM	<i>brown sand, silt, peat wash</i> <i>Moisture content 108%</i>				
15	SPT-2	8	3-3	22"	Moist, brown PEAT, trace sand, silt, and clay, very soft	PT	<i>Moisture content 34%,</i> <i>Plastic limit 23, Liquid limit 49,</i> <i>Plastic index 26</i>				
20	SPT-2	8	5-6	22"	Moist, brown gray CLAY, trace silt and peat, very soft	CL					
20	OT-1	-	Hyd push	24"	Moist, light brown CLAY, few silt, medium stiff	CL	<i>Moisture content 35.9%</i>				
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date			
SPT=2" SPLIT SPOON		few	5 to 10%								
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose							
OT=OSTERB. TUBE		some	30 to 45%	Cohesive Consistency 0-2 Very Soft							
RUN=ROCK CORE		mostly	>50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff							
				16-30 V-Stiff, 31+ Hard							

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension					SHEET 2 of 4		BORING NO. B-50	
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256		Elevation: 7.0'	
					LOCATION: N 2970073 E 780070		Total Depth: 84.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS	
	OT-1	-	Hyd push	24"	Moist, olive gray CLAY	CL	Moisture content 35.9%	
25	SPT-3	0	woh/24"	24"	Moist, olive CLAY, very soft	CL		
30	SPT-4	0	woh/24"	24"	Moist, light gray CLAY, very soft	CL	Moisture content 41.1%	
35	SPT-5	0	woh/24"	24"	Moist, olive CLAY, very soft	CL		
40	SPT-6	0	woh/24"	16"	Moist, light brown gray CLAY, very soft	CL	Moisture content 39.0 Plastic limit 23, Liquid limit 46 Plastic index 23	
45	SPT-7	0	woh/24"	20"	Moist, olive CLAY, very soft	CL		
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%					
SS3=3" SPLIT SPOON		little	15 to 25%					
OT=OSTERB. TUBE		some	30 to 45%					
RUN=ROCK CORE		mostly	>50%					
				Cohesionless Density:		Cohesive Consistency		
				0-4 Very Loose		0-2 Very Soft		
				5-9 Loose 10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff		
				30-49 Dense 50+ Very Dense		16-30 V-Stiff, 31+ Hard		

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-50	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2970073 E 780070		7.0'		84.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
50	SPT-7	0	woh/24"	20"	Moist, olive CLAY, very soft		CL	Moisture content 25.9		
55	SPT-8	0	woh/23" 1	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL			
60	SPT-9	0	woh/24"	24"	Moist, olive CLAY, silt and fine sand lenses, very soft		CL			
65	OT-2	-	Hyd push	23"	Moist, olive CLAY, very soft		CL			
70	SPT-10	0	woh/24"	16"	Moist, olive CLAY, very soft		CL			
	SPT-11	1	1-1	2"	Moist, olive CLAY, very soft		CL			
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency 0-2 Very Soft	
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		4 of 4		B-50	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2970073 E 780070		7.0'		84.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-11	1	woh/12"	2"	Moist, olive CLAY, very soft		CL	4" Roller bit open hole to 84' bgs (07:30 to 09:00, 12/30/13)		
					gray clay wash, no sand or silt		CL wash			
75					Roller bit advance thru gravels or cobbles					
					gray sand wash, little gravel and silt					
80					steady Roller bit advance, occasional gravel		SM wash			
					slow Roller bit advance thru gravels					
85					End of Boring @ 84.0' bgs			bentonite and cement Grout placed from 0' to 84' bgs (12/30/13)		
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft	
						5-9 Loose			3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
						10-29 Med. Dense				
						30-49 Dense			16-30 V-Stiff, 31+ Hard	
						50+ Very Dense				

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 4		B-51	
MBTA Right of Way Chelsea, MA				LOCATION: N 2970034 E 780048		Elevation: 7.3'		Total Depth: 71.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 1/6/2014			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 1/6/2014			
Hole Size : HW Casing - 4" ID		Weather : 01/06/14 cloudy-rain 45 F				Ground Water (Depth/Elev.) : 5' bgs (12/19/13)			
Drilling Method : Rotary Wash with Roller Bit				Drilling Fluid : Water		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, roadbed ballast stone and black GRAVEL and SAND, few silt FILL	GW to SW	Air Knife to 6' bgs (12/19/13)		
							Hazmat sample		
							Hazmat sample		
							HW casing pushed 0' to 6' bgs		
							Brown gravel and sand wash		
10	SPT-1	2	2-1 1-1	0	Wet, dark brown PEAT, very soft Moist, brown-gray CLAY, few peat, very soft Moist, blue-gray CLAY, trace peat, very soft	PT	HW casing pushed 6' to 9' bgs		
							brown to red-brown sand and PEAT wash		
15	SPT-2	1	woh/14" 1-3	18"	Moist olive CLAY, stiff	OH			
20	SPT-3	11	4-4 7-7	10"	Moist olive CLAY, medium stiff	CL			
	SPT-4	7	2-4	4"		CL			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
OT=OSTERB. TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION:					JOB NO.: 60242256		2 of 4		B-51	
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:	
					N 2970034 E 780048		7.3'		71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS			
	SPT-4	7	3-4	4"	Moist, olive CLAY, medium stiff	CL	<i>Roller bit - open hole</i>			
25	SPT-5	0	woh/18"	24"	Moist, olive CLAY, very soft	CL				
			3							
30	OT-1	-	hydraulic push tube	24"	Moist, olive CLAY, very soft	CL				
35	SPT-6	0	woh/24"	24"	Moist, olive CLAY, very soft	CL				
40	SPT-7	0	woh/18"	24"	Moist, olive CLAY, very soft	CL				
			1							
45	SPT-8	0	woh/24"	24"	Moist, olive CLAY, fine sand lenses, very soft	CL				
SAMPLE TYPES:		trace	0 to 5%		SPT Resistance					Approve/Date
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%							
OT=OSTERB. TUBE		some	30 to 45%							
RUN=ROCK CORE		mostly	>50%							
					Cohesionless Density:		0-4 Very Loose		Cohesive Consistency 0-2 Very Soft	
					5-9 Loose		10-29 Med. Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
					30-49 Dense		50+ Very Dense		16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.					
SITE LOCATION:					JOB NO.: 60242256		3 of 4		B-51				
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:				
					N 2970034 E 780048		7.3'		71.0'				
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS					
50	SPT-8	0	woh/24"	24"	Moist, olive CLAY, fine sand lenses, very soft		CL	<i>Roller bit- open hole</i>					
55	SPT-9	0	woh/24"	12"	Moist, olive CLAY, very soft		CL						
60	SPT-10	0	woh/24"	14"	Moist, olive CLAY, very soft		CL						
65	SPT-11	0	woh/24"	24"	Moist, olive to light gray CLAY, very soft		CL						
70	OT-2	-	hydraulic push tube	24"	Moist, olive CLAY, very soft		CL						
	SPT-12	0	woh/18"	24"	Moist, light gray CLAY, silt and fine sand lenses, very soft		CL						
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date				
SPT=2" SPLIT SPOON		few	5 to 10%										
SS3=3" SPLIT SPOON		little	15 to 25%										
OT=OSTERB. TUBE		some	30 to 45%										
RUN=ROCK CORE		mostly	>50%										
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft				
						5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
						30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.		
SITE LOCATION: MBTA Right of Way Chelsea, MA					JOB NO.: 60242256		4 of 4		B-51	
					LOCATION: N 2970034 E 780048		Elevation: 7.3'		Total Depth: 71.0'	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.	REMARKS		
71	SPT-12	0	1	24"	Moist, light gray CLAY, silt and fine sand lenses, very soft		CL			
					End of Boring @ 71.0' bgs					
75										
80										
85										
90										
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%							
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose					Cohesive Consistency 0-2 Very Soft	
OT=OSTERB. TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense					3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense					16-30 V-Stiff, 31+ Hard	

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-52	
MBTA Right of Way Chelsea, MA				LOCATION: N 2970105 E 779948		Elevation: 6.9'		Total Depth: 12.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/30/2013			
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/30/2013			
Hole Size : 3.25" ID		Weather : 12/30/13 partly cloudy 35 F				Ground Water (Depth/Elev.) : 6.0' bgs (12/30/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, ballast stone and black GRAVEL and SAND, little silt	GM to SM	<i>Hand auger to 6' bgs (12/19/13)</i>		
					FILL				
					Moist, light brown GRAVEL and SAND, few silt				
					Wet, brown SILT, some sand, few peat, loose	MH			
					Moist, brown CLAY, trace sand and peat, very soft	CL			
10	SPT-1	0	woh/24"	16"			<i>Moisture content 65% gravel 1.6%, sand 44.1%, fines 54.3% Plastic limit 32, Liquid limit 60, Plastic index 28 Organic content 7.8%</i>		
15	SPT-2	12	3-4 8-12	14"	Dry, olive gray CLAY, trace peat, stiff	CL	End of Boring @ 12.0' bgs		
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some 30 to 45%		Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly >50%		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-53	
MBTA Right of Way Chelsea, MA				LOCATION: N 2970065 E 779889		Elevation: 6.3'		Total Depth: 12.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/31/2013			
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/31/2013			
Hole Size : 3.25" ID		Weather : 12/31/13 cloudy 16 F				Ground Water (Depth/Elev.) : 5.0' bgs (12/31/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, ballast stone and black GRAVEL and SAND, little silt FILL	GM to SM	Air Knife to 6' bgs (12/19/13)		
	SPT-1	0	woh/24"	20"	Wet, brown PEAT, little silt, very soft	PT	Resistivity= 537 ohm-cm Chloride content= 3700 mg/kg Sulfate content= 5000 mg/kg pH= 7.1 (distilled water)		
10					Moist, olive to light brown CLAY, trace silt, very stiff	CL			
15					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%						
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose					
ST=SHELBY TUBE		some	30 to 45%	Cohesive Consistency 0-2 Very Soft					
RUN=ROCK CORE		mostly	>50%	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
				5-9 Loose 10-29 Med. Dense					
				30-49 Dense 50+ Very Dense					
				16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-54				
MBTA Right of Way Chelsea, MA				LOCATION: N 2970092 E 779837		Elevation: 7.1'		Total Depth: 12.0				
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/31/2013						
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/31/2013						
Hole Size : 3.25" ID		Weather : 12/31/13 cloudy 18 F				Ground Water (Depth/Elev.) : 5' bgs (12/31/13)						
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	BULK SAMPLE				Dry, ballast stone and black GRAVEL and SAND, little silt FILL	GM to SM	Air Knife to 6' bgs (12/19/13)					
10	SPT-1	1	woh/12"	20"	Wet, brown PEAT, some silt and clay, very soft	PT						
			1/12"									
15	SPT-2	18	14-8	22"	Dry, olive CLAY, trace silt, very stiff	CL						
			10-12									
15					End of Boring @ 12.0' bgs							
SAMPLE TYPES:		trace 0 to 5%	SPT Resistance				Approve/Date					
SPT=2" SPLIT SPOON		few 5 to 10%										
SS3=3" SPLIT SPOON		little 15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft									
ST=SHELBY TUBE		some 30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff									
RUN=ROCK CORE		mostly >50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard									

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:						JOB NO.: 60242256		1 of 1	
MBTA Right of Way Chelsea, MA						LOCATION:		Elevation:	
						N 2970161 E 779739		6.0'	
DRILL CONTRACTOR : Northern Drill Service						ENG : William Checchi		BEGUN: 12/30/2013	
DRILL RIG : ATV Mobile B48, Auto Hammer						DRILLER : Tim Tucker		FINISHED : 12/30/2013	
Hole Size : 3.25" ID		Weather : 12/30/13 cloudy 45 F				Ground Water (Depth/Elev.) : 5' bgs (12/30/13)			
Drilling Method : Hollow Stem Auger						Drilling Fluid : None		Top of Rock (Depth) : Not Encountered	
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, ballast stone and black GRAVEL and SAND, little silt	GM to SM	Air Knife to 6' bgs (12/19/13) wet drill rod		
					FILL				
10					Moist, light brown GRAVEL and SAND, little silt	GM to SM			
	SPT-1	0	woh/18"	18"	Wet, brown PEAT, some sand, silt and clay, very soft	PT			
				4	Moist, olive CLAY, few peat, very soft	CL			
15									
	SPT-2	22	5-10	20"	Dry, light brown and gray CLAY, trace silt, very stiff	CL			
				12-14					
15					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.				
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-56				
MBTA Right of Way Chelsea, MA				LOCATION: N 2970084 E 779698		Elevation: 11.9		Total Depth: 12.0				
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/18/2013						
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/18/2013						
Hole Size : 3.25" ID		Weather : 12/18/13 partly cloudy 30 F				Ground Water (Depth/Elev.) : 9 bgs' (12/18/13)						
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered						
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS					
5	SPT-1	15	6-7	10"	Dry, brown topsoil	SM						
			8-9		Dry, brown SAND, little gravel and silt, medium dense							
	SPT-2	11	4-5	14"	FILL	GM to SM						
			6-6		Dry, brown GRAVEL and SAND, little silt, medium dense							
10	SPT-3	19	6-9	20"	Dry, black SAND, little gravel and silt	SM						
			10-9		Wet, light brown SAND, little silt, medium dense							
	SPT-4	2	woh/12"	10"	Wet, light brown SAND, little silt, loose	SM						
			2-2		Wet, brown PEAT, little gravel, sand, silt, and red brick chips, very soft							
End of Boring @ 16.0' bgs												
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date		
SPT=2" SPLIT SPOON		few	5 to 10%									
SS3=3" SPLIT SPOON		little	15 to 25%	Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft								
ST=SHELBY TUBE		some	30 to 45%	5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff								
RUN=ROCK CORE		mostly	>50%	30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard								

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-57			
MBTA Right of Way Chelsea, MA				LOCATION: N 2970144 E 779641		Elevation: 6.4'		Total Depth: 17.0'			
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/31/2013					
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/31/2013					
Hole Size : 3.25" ID		Weather : 12/31/13 cloudy 18 F				Ground Water (Depth/Elev.) : 5.0' bgs (12/19/13)					
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered					
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS				
5	Bulk Sample				Dry, black GRAVEL and SAND, few silt	GW to SW	<i>Air Knife to 6' bgs (12/19/13)</i> <i>Hazmat sample</i> <i>gravel 38.6%, sand 51.2% fines 10.2%</i>				
					FILL						
					Dry, tan to brown SAND, some gravel, few silt					SW	<i>Hazmat sample</i>
10	SPT-1	10	8-8	6"	Wet, brown SAND, some gravel, little silt, medium dense	SM	<i>brown PEAT and CLAY wash</i>				
			2-5		Moist, blue-gray CLAY, trace peat, medium stiff	OH					
15	SPT-2	2	1-1	20"	Wet, dark brown PEAT, very soft	PT	<i>brown PEAT and CLAY wash</i>				
			1-1								
15	SPT-3	3	woh/14"	18"		PT					
			3-7		Moist, blue gray CLAY, trace peat, very soft	OH					
					End of Boring @ 17.0' bgs						
SAMPLE TYPES:					SPT Resistance					Approve/Date	
SPT=2" SPLIT SPOON					Cohesionless Density: 0-4 Very Loose						
SS3=3" SPLIT SPOON					Cohesive Consistency 0-2 Very Soft						
ST=SHELBY TUBE					3-4 Soft, 5-8 M/Stiff, 9-15 Stiff						
RUN=ROCK CORE					16-30 V-Stiff, 31+ Hard						
trace 0 to 5%					5-9 Loose 10-29 Med. Dense						
few 5 to 10%					30-49 Dense 50+ Very Dense						
little 15 to 25%											
some 30 to 45%											
mostly >50%											

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 2		B-58	
MBTA Right of Way Chelsea, MA				LOCATION: N 2970160 E 779561		Elevation: 6.4'		Total Depth: 22.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/31/2013			
DRILL RIG : ATV Mobile B-48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/31/2013			
Hole Size : 3.25" ID		Weather : 12/31/13 cloudy 20 F				Ground Water (Depth/Elev.) : 5' bgs (12/31/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, ballast stone and black GRAVEL and SAND, little silt	GM to SM	Air Knife to 6' bgs (12/20/13)		
					FILL				
					Dry, light brown GRAVEL and SAND, little silt	GM to SM			
10									
					Wet, black to gray GRAVEL and SAND, little silt, loose	GM to SM			
15									
					Wet, blue gray CLAY, few fine sand and silt				
20									
					Moist, blue gray CLAY, few fine sand and silt, trace peat, medium stiff	CH			
20									
					Moist, light brown PEAT, little fine sand and silt, very soft	PT			
20									
					Moist, light brown PEAT, little fine sand and silt, soft	PT			
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
OT=OSTERB. TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.			
SITE LOCATION:					JOB NO.: 60242256		2 of 2		B-58		
MBTA Right of Way Chelsea, MA					LOCATION:		Elevation:		Total Depth:		
					N 2970160 E 779561		6.4'		22.0'		
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION		ASTM Class.		REMARKS		
	SPT-4	11	1-5	16"	Moist, light brown PEAT, very soft		PT				
			6-8		Dry, blue gray CLAY, trace silt, stiff		CL				
25					End of Boring @ 22.0' bgs						
30											
35											
40											
45											
SAMPLE TYPES:		trace	0 to 5%	SPT Resistance						Approve/Date	
SPT=2" SPLIT SPOON		few	5 to 10%								
SS3=3" SPLIT SPOON		little	15 to 25%								
OT=OSTERB. TUBE		some	30 to 45%								
RUN=ROCK CORE		mostly	>50%								
				Cohesionless Density:		0-4 Very Loose	Cohesive Consistency		0-2 Very Soft		
						5-9 Loose	10-29 Med. Dense	3-4 Soft, 5-8 M/Stiff, 9-15 Stiff			
						30-49 Dense	50+ Very Dense	16-30 V-Stiff, 31+ Hard			

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-59	
MBTA Right of Way Chelsea, MA				LOCATION: N 2970208 E 779567		Elevation: 6.0'		Total Depth: 12.0	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/30/2013			
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/30/2013			
Hole Size : 3.25" ID		Weather : 12/30/13 partly cloudy 35 F				Ground Water (Depth/Elev.) : 5' bgs (12/18/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5					Dry, ballast stone and black GRAVEL and SAND, little silt	GM to SM	Hand Auger to 6' bgs (12/19/13)		
					Moist, light brown SAND, little gravel and silt FILL	SM			
					Wet, brown GRAVEL and SAND, little silt, medium dense	GM to SM			
	SPT-1	19	5-6 13-15	4"					
10					Wet, dark brown PEAT and organic SILT, some sand, very soft	PT to OH	moisture content 167%, organics 22.9% sand 30.3%, fines 69.7% Plastic limit 85, Liquid limit 172, Plastic index 87		
	SPT-2	0	woh/24"	16"					
15					End of Boring @ 12.0' bgs				
SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%		Cohesionless Density: 0-4 Very Loose Cohesive Consistency 0-2 Very Soft					
ST=SHELBY TUBE		some 30 to 45%		5-9 Loose 10-29 Med. Dense 3-4 Soft, 5-8 M/Stiff, 9-15 Stiff					
RUN=ROCK CORE		mostly >50%		30-49 Dense 50+ Very Dense 16-30 V-Stiff, 31+ Hard					

GEOLOGIC LOG



PROJECT : MassDOT Silver Line Extension						SHEET		BORING NO.	
SITE LOCATION:				JOB NO.: 60242256		1 of 1		B-60	
MBTA Right of Way Chelsea, MA				LOCATION: N 2970193 E 779450		Elevation: 6.4'		Total Depth: 17.0'	
DRILL CONTRACTOR : Northern Drill Service				ENG : William Checchi		BEGUN: 12/31/2013			
DRILL RIG : ATV Mobile B48, Auto Hammer				DRILLER : Tim Tucker		FINISHED : 12/31/2013			
Hole Size : 3.25" ID		Weather : 12/31/13 cloudy 20 F				Ground Water (Depth/Elev.) : 6.0' bgs (12/31/13)			
Drilling Method : Hollow Stem Auger				Drilling Fluid : None		Top of Rock (Depth) : Not Encountered			
Depth (ft)	Sample Type/No.	N Value	Blow Count (per 6 in.)	Sample Recovery (inches)	SAMPLE DESCRIPTION	ASTM Class.	REMARKS		
5	Bulk Sample				Dry, black GRAVEL and SAND, little silt	GM to SM	<i>Air Knife to 6' bgs (12/19/13)</i> <i>Hazmat sample</i> <i>Hazmat sample</i> <i>Hazmat sample</i> <i>auger grinding thru gravels</i>		
					FILL				
10	SPT-1	9	7-6	6"	Dry, tan to brown SAND, some gravel and little silt	SM	<i>Hazmat sample</i> <i>auger grinding thru gravels</i>		
			3-2						
15	SPT-2	0	woh/24"	22"	Wet, brown SAND, some gravel, little silt, medium dense	SM	<i>Hazmat sample</i> <i>auger grinding thru gravels</i>		
20	SPT-3	1	woh/14"	24"	Wet, gray CLAY, trace silt and peat, very soft	OH	<i>Hazmat sample</i> <i>auger grinding thru gravels</i>		
					Moist, dark brown CLAY, few peat and silt, very soft	OH	<i>Hazmat sample</i> <i>auger grinding thru gravels</i>		
					End of Boring @ 17.0' bgs		<i>Hazmat sample</i> <i>auger grinding thru gravels</i>		

SAMPLE TYPES:		trace 0 to 5%		SPT Resistance				Approve/Date	
SPT=2" SPLIT SPOON		few 5 to 10%							
SS3=3" SPLIT SPOON		little 15 to 25%							
ST=SHELBY TUBE		some 30 to 45%							
RUN=ROCK CORE		mostly >50%							
				Cohesionless Density:		0-4 Very Loose		Cohesive Consistency	
						5-9 Loose 10-29 Med. Dense		0-2 Very Soft	
						30-49 Dense 50+ Very Dense		3-4 Soft, 5-8 M/Stiff, 9-15 Stiff	
								16-30 V-Stiff, 31+ Hard	

ATTACHMENT 2

OBSERVATION WELL INSTALLATION LOGS

OBSERVATION WELL INSTALLATION LOG



PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256	WELL NO. B-10		
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2967794 E: 784421			
BEGUN: 12/2/2013	ENG: W. Checchi		WATER LEVEL (Depth) Top of Roadbox (12/31/2013)		
FINISHED: 12/2/2013	DRILLER: T. Tucker				
<div><div>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</div></div>			DEPTH (FT)	ELEV. (FT)	
			0.0	12.3	
<div><div><div><div><div>PVC RISER CASING: SCH.: 40 DIAM.: 2 INCH</div><div>BACKFILL MATERIAL: TYPE: WASH SOIL</div><div>ANNULAR SEAL MATERIAL: TYPE: BENTONITE CHIPS</div><div>PVC SCREEN: SCH.: 40 DIAM.: 2 INCH SLOT SIZE: 0.010 INCH</div><div>FILTER PACK TYPE: SAND SIZE: Holliston #1s</div></div><div><div>GROUND SURFACE</div><div>TOP OF PVC RISER</div><div>BOTTOM OF PROTECTIVE ROADBOX</div><div>TOP OF ANNULAR SEAL</div><div>TOP OF FILTER PACK</div><div>TOP OF WELL SCREEN</div><div>BOTTOM OF SCREEN</div><div>BOTTOM OF HOLE</div></div><div>4.5 INCH (DIAM.)</div></div></div></div>			0.2	12.1	
			0.8	11.5	
			15.0	-2.7	
			17.0	-4.7	
			19.0	-6.7	
			29.0	-16.7	
			31.0	-18.7	
			METHOD DRILLED: 4" ID HW Casing-Rotary wash		Notes:
			METHOD/TIME DEVELOPED: BAILER		

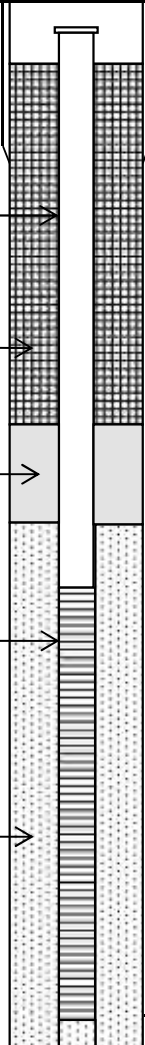
OBSERVATION WELL INSTALLATION LOG



PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256	WELL NO. B-14	
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2967936 E: 784410		
BEGUN: 11/21/2013	ENG: W. Checchi		WATER LEVEL (Depth) 5.2' (12/31/2013)	
FINISHED: 11/21/2013	DRILLER: W. Tucker / T. Tucker			
<div><div><div>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</div><div><div><div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div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OBSERVATION WELL INSTALLATION LOG



PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256	WELL NO. B-23	
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2968922 E: 783601		
BEGUN: 11/25/2013	ENG: W. Checchi		WATER LEVEL (Depth) 4.1' (12/31/2013)	
FINISHED: 11/25/2013	DRILLER: W. Tucker			
<div>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</div> 			DEPTH (FT)	ELEV. (FT)
			0.0	10.0
<div>PVC RISER CASING: SCH.: 40 DIAM.: 2 INCH</div> <div>BACKFILL MATERIAL: TYPE: WASH SOIL</div> <div>ANNULAR SEAL MATERIAL: TYPE: BENTONITE CHIPS</div> <div>PVC SCREEN: SCH.: 40 DIAM.: 2 INCH SLOT SIZE: 0.010 INCH</div> <div>FILTER PACK TYPE: SAND SIZE: Holliston #1s</div>			0.2	9.8
			0.8	9.2
<div>GROUND SURFACE</div> <div>TOP OF PVC RISER</div> <div>BOTTOM OF PROTECTIVE ROADBOX</div> <div>TOP OF ANNULAR SEAL</div> <div>TOP OF FILTER PACK</div> <div>TOP OF WELL SCREEN</div> <div>BOTTOM OF SCREEN</div> <div>BOTTOM OF HOLE</div>			5.5	4.5
			7.5	2.5
<div>METHOD DRILLED: 4" ID HW Casing- Rotary wash</div> <div>METHOD/TIME DEVELOPED: BAILER</div>			9.0	1.0
			19.0	-9.0
4.5 INCH (DIAM.)			21.0	-11.0
Notes:				

OBSERVATION WELL INSTALLATION LOG



PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256	WELL NO. B-26	
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2969182 E: 783262		
BEGUN: 1/20/2014	ENG: W. Checchi		WATER LEVEL (Depth) 8.8' (01/23/14)	
FINISHED: 1/21/2014	DRILLER: T. Tucker			
<p>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</p> <p>GROUND SURFACE</p> <p>TOP OF PVC RISER</p> <p>BOTTOM OF PROTECTIVE ROADBOX</p> <p>PVC RISER CASING: SCH.: 40 DIAM.: 2 INCH</p> <p>BACKFILL MATERIAL: TYPE: SAND AND CUTTINGS</p> <p>ANNULAR SEAL MATERIAL: TYPE: BENTONITE CHIPS</p> <p>TOP OF ANNULAR SEAL</p> <p>TOP OF FILTER PACK</p> <p>TOP OF WELL SCREEN</p> <p>PVC SCREEN: SCH.: 40 DIAM.: 2 INCH SLOT SIZE: 0.010 INCH</p> <p>FILTER PACK TYPE: SAND SIZE: Holliston #1s</p> <p>BOTTOM OF SCREEN</p> <p>BACKFILL MATERIAL: TYPE: GROUT</p> <p>BOTTOM OF HOLE</p> <p>4.5 INCH (DIAM.)</p>			DEPTH (FT)	ELEV. (FT)
			0.0	10.8
			0.3	10.5
			0.8	10.0
			6.0	4.8
			7.0	3.8
			10.0	0.8
			20.0	-9.2
			22.0	-11.2
			71.0	-60.2
METHOD DRILLED: 4" ID HW Casing- Rotary wash METHOD/TIME DEVELOPED: BAILER			Notes:	

OBSERVATION WELL INSTALLATION LOG



PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256	WELL NO. B-30A	
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2969359 E: 782585		
BEGUN: 1/27/2014	ENG: W. Checchi		WATER LEVEL (Depth) 5.6' (01/30/14)	
FINISHED: 1/28/2014	DRILLER: T. Tucker			
<p>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</p> <p>GROUND SURFACE</p> <p>TOP OF PVC RISER</p> <p>BOTTOM OF PROTECTIVE ROADBOX</p> <p>PVC RISER CASING: SCH.: 40 DIAM.: 2 INCH</p> <p>BACKFILL MATERIAL: TYPE: SAND AND CUTTINGS</p> <p>ANNULAR SEAL MATERIAL: TYPE: BENTONITE CHIPS</p> <p>TOP OF ANNULAR SEAL</p> <p>TOP OF FILTER PACK</p> <p>TOP OF WELL SCREEN</p> <p>PVC SCREEN: SCH.: 40 DIAM.: 2 INCH SLOT SIZE: 0.010 INCH</p> <p>FILTER PACK TYPE: SAND SIZE: Holliston #1s</p> <p>BOTTOM OF SCREEN</p> <p>BACKFILL MATERIAL: TYPE: GROUT</p> <p>BOTTOM OF HOLE</p> <p>4.5 INCH (DIAM.)</p> <p>METHOD DRILLED: 4" ID HW Casing- Rotary wash</p> <p>METHOD/TIME DEVELOPED: BAILER</p> <p>Notes:</p>			DEPTH (FT)	ELEV. (FT)
			0.0	9.8
			0.4	9.4
			0.8	9.0
			3.0	6.8
			4.0	5.8
			10.0	-0.2
			20.0	-10.2
			21.0	-11.2
			71.0	-61.2

OBSERVATION WELL INSTALLATION LOG



PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256		WELL NO. B-35	
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2969523 E: 781962			
BEGUN: 2/3/2014	ENG: W. Checchi			WATER LEVEL (Depth) 6.6' (2/10/14)	
FINISHED: 2/3/2014	DRILLER: T. Tucker				
<p>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</p>				DEPTH (FT)	ELEV. (FT)
				0.0	8.7
				0.3	8.4
				0.7	8.0
				3.0	5.7
				4.0	4.7
				10.0	-1.3
				20.0	-11.3
				22.0	-13.3
<p>METHOD DRILLED: 3.25" ID Hollow Stem Auger</p> <p>METHOD/TIME DEVELOPED: BAILER</p>				Notes:	

OBSERVATION WELL INSTALLATION LOG

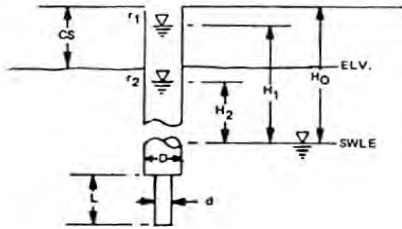


PROJECT: MassDOT Silver Line Extension Chelsea MA		JOB NO. 60242256	WELL NO. B-41																			
DRILLING CONTRACTOR: Northern Drill Service		COORDINATES: N: 2969853 E: 780749																				
BEGUN: 1/8/2014	ENG: W. Checchi		WATER LEVEL (Depth) 4.4' (1/10/14)																			
FINISHED: 1/8/2014	DRILLER: T. Tucker																					
<div><div><div>FLUSHMOUNT ROADBOX W/ GASKETS AND CEMENT SEAL</div><div><div><div><div>PVC RISER CASING: SCH.: 40 DIAM.: 2 INCH</div><div>BACKFILL MATERIAL: TYPE: SAND</div><div>ANNULAR SEAL MATERIAL: TYPE: BENTONITE CHIPS</div><div>PVC SCREEN: SCH.: 40 DIAM.: 2 INCH SLOT SIZE: 0.010 INCH</div><div>FILTER PACK TYPE: SAND SIZE: Holliston #1s</div></div><div><div>METHOD DRILLED: 3.25" ID Hollow Stem Auger</div><div>METHOD/TIME DEVELOPED: BAILER</div></div></div><div><div>GROUND SURFACE</div><div>TOP OF PVC RISER</div><div>BOTTOM OF PROTECTIVE ROADBOX</div><div>TOP OF ANNULAR SEAL</div><div>TOP OF FILTER PACK</div><div>TOP OF WELL SCREEN</div><div>BOTTOM OF SCREEN</div><div>BOTTOM OF HOLE</div></div><div>7 INCH (DIAM.)</div></div></div><tr><td>DEPTH (FT)</td><td>ELEV. (FT)</td></tr><tr><td>+0.2</td><td>8.5</td></tr><tr><td>0.0</td><td></td></tr><tr><td>0.2</td><td>8.1</td></tr><tr><td>0.6</td><td>7.7</td></tr><tr><td>2.0</td><td>6.3</td></tr><tr><td>4.0</td><td>4.3</td></tr><tr><td>10.0</td><td>-1.7</td></tr><tr><td>20.0</td><td>-11.7</td></tr><tr><td>22.0</td><td>-13.7</td></tr></div>			DEPTH (FT)	ELEV. (FT)	+0.2	8.5	0.0		0.2	8.1	0.6	7.7	2.0	6.3	4.0	4.3	10.0	-1.7	20.0	-11.7	22.0	-13.7
			DEPTH (FT)	ELEV. (FT)																		
			+0.2	8.5																		
			0.0																			
			0.2	8.1																		
			0.6	7.7																		
			2.0	6.3																		
			4.0	4.3																		
			10.0	-1.7																		
			20.0	-11.7																		
22.0	-13.7																					

ATTACHMENT 3

FALLING HEAD TEST DATA & ANALYSES

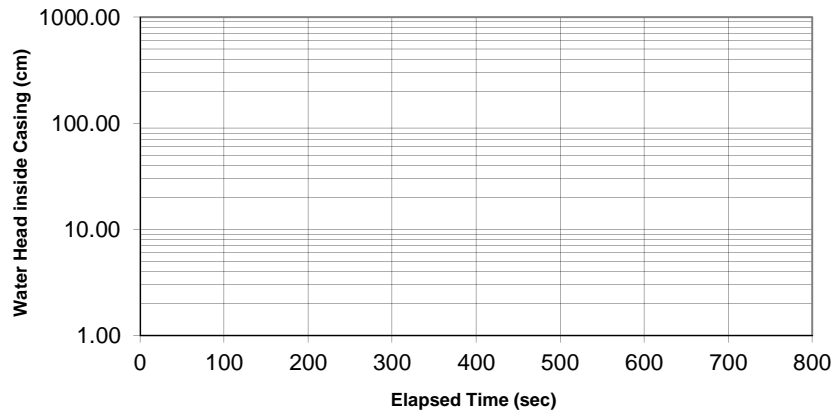
STAGE 2 CALCULATIONS



(*see Note 1)

$$K_h = 0.0000 \frac{*LN(H_1/H_2)/(t_2-t_1)}{}$$

1. *Falling head test was performed above the static water table.*
2. *Artesian conditions were later observed in the B-10 well; the B-10 well is screened from 19 to 29 ft.*
3. *Soils in test zone are described as: Olive clay, some sand, little gravel, few silt (Glacial Till).*



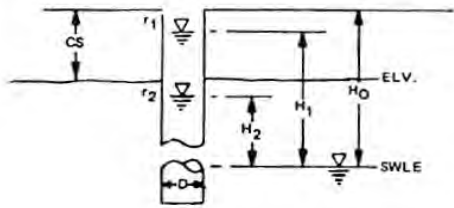
$m =$ _____

Jose A. Roman

FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 1 CALCULATIONS



$$D = 10.16 \text{ cm}$$

$$CS = 45.72 \text{ cm}$$

$$H_0 = 256.64 \text{ cm}$$

Project: MassDOT

Silver Line Extension

Chelsea, MA

Project No.: 60242256.1901.01

Test No.: B-14

Test Depth: 9.0 ft.

Calculations:

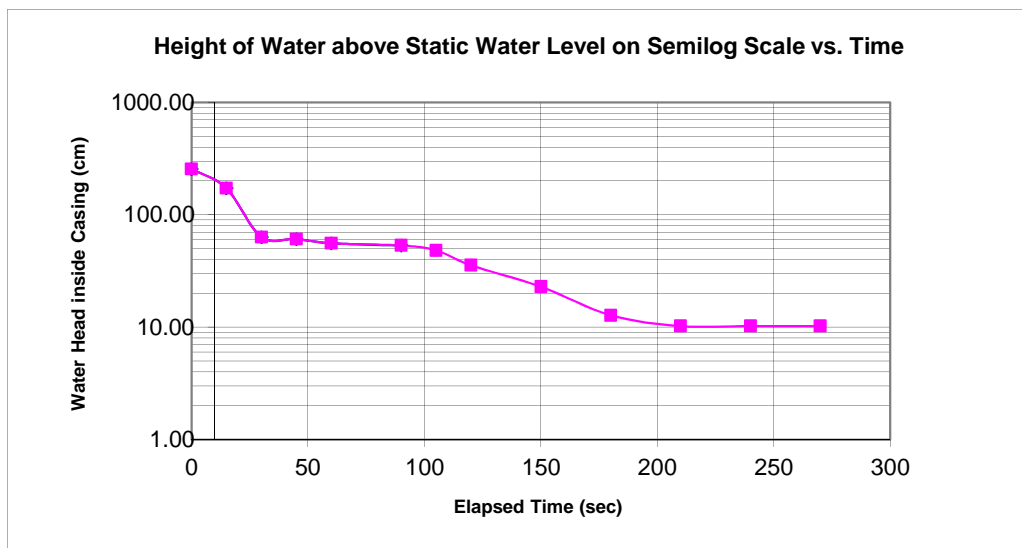
$$K_m = [3.14 \cdot D / 11] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$K_m = 2.90 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Km (cm/s)
							SETUP
11/21/2014	0.00	0	0.00	0.00	256.64	-	-
	0.25	15	2.75	83.82	172.82	2.6E-02	7.6E-02
	0.50	30	6.33	192.94	63.70	6.7E-02	1.9E-01
	0.75	45	6.42	195.58	61.06	2.8E-03	8.2E-03
	1.00	60	6.58	200.66	55.98	5.8E-03	1.7E-02
	1.50	90	6.67	203.18	53.46	1.5E-03	4.5E-03
	1.75	105	6.83	208.28	48.36	6.7E-03	1.9E-02
	2.00	120	7.25	220.98	35.66	2.0E-02	5.9E-02
	2.50	150	7.67	233.66	22.98	1.5E-02	4.2E-02
	3.00	180	8.00	243.84	12.80	2.0E-02	5.7E-02
	3.50	210	8.08	246.38	10.26	7.4E-03	2.1E-02
	4.00	240	8.08	246.38	10.26	Invalid	Invalid
	4.50	270	8.08	246.38	10.26	Invalid	Invalid

Notes:

1. No Sample Recovery was recorded for the 9 to 11 SPT sample.



$$K_m = 5.0E-02 \text{ cm/s}$$

Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

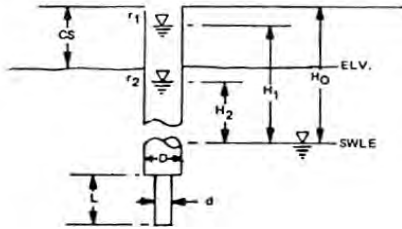
Prepared by:

K. Harten

Reviewed by:

Jose A. Ramos

STAGE 2 CALCULATIONS



Project: MassDOT
Silver Line Extension
Chelsea, MA

Project No.: 60242256.1901.01

Test No.: **B-14**

Test Depth: **9.0 - 11.0 ft.**

$$K_h = \frac{[D^2 \cdot \ln[mL/d + \sqrt{1 + (mL/d)^2}] / (8L)] \cdot \ln(H_1/H_2) / (t_2 - t_1)}{m} = \frac{[D^2 \cdot \ln[mL/d + \sqrt{1 + (mL/d)^2}] / (8L)] \cdot \ln(H_1/H_2) / (t_2 - t_1)}{m}$$

Height of Water above Static Water Level on Semilog Scale vs. Time

Water Head Inside Casing (cm)

Elapsed Time (sec)

Check m value:

Prepared by:

K. Harten

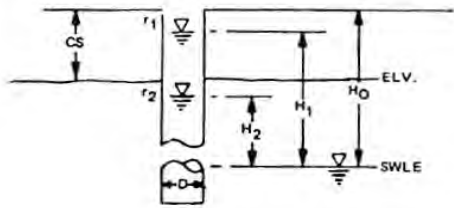
Reviewed by:

Jose R. Ramos

FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 1 CALCULATIONS



$$D = \frac{10.16}{\text{cm}}$$

$$CS = \frac{45.72}{\text{cm}}$$

$$H_0 = \frac{\text{See Note 2}}{\text{cm}}$$

Project: MassDOT

Silver Line Extension

Chelsea, MA

Project No.: 60242256.1901.01

Test No.: B-17

Test Depth: 9.0 ft.

Calculations:

$$K_m = [3.14 \cdot D / 11] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

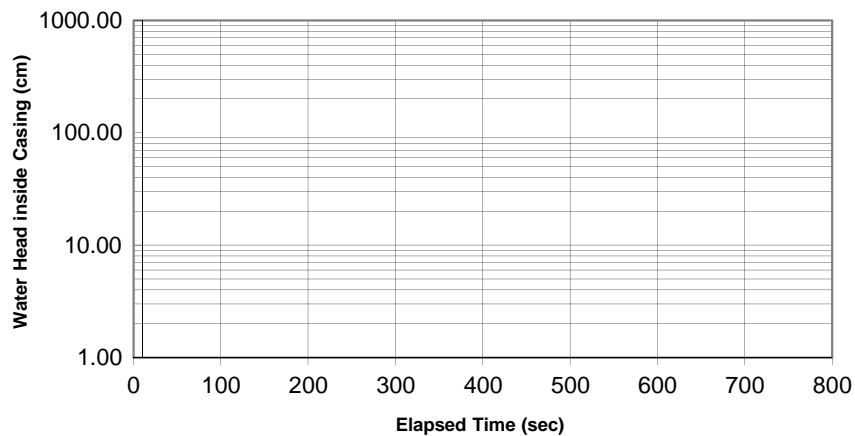
$$K_m = \frac{2.90}{\text{cm/s}} \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Km (cm/s)
							SETUP
	0.0	0	0.00	0.00			
	2.0	120	0.00	0.00			
	5.0	300	0.00	0.00			
	10.0	600	0.00	0.00			
	15.0	900	0.00	0.00			
	Materials are impermeable - no measurable drop in head was observed						

Notes:

- Soils in test zone are described as: *Gray fines with little sand & gravel (Glacial Till).*
- The static water level could not be determined at the time of drilling.

Height of Water above Static Water Level on Semilog Scale vs. Time

Km = Impermeable cm/s

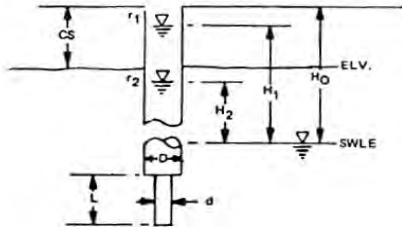
Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:	K. Harten	Reviewed by:	<i>Jose A. Ramon</i>
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FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 2 CALCULATIONS



$d = 5.08$ cm
 $D = 10.16$ cm
 $CS = 45.72$ cm
 $L = 60.96$ cm
 $H_0 = \text{See Note 2}$ cm

Project: MassDOT
 Silver Line Extension
 Chelsea, MA

Project No.: 60242256.1901.01

Test No.: **B-17**

Test Depth: **9.0 - 11.0 ft.**

Calculations:

$$K_h = [D^2 \cdot \ln[mL/d + \text{SQRT}(1 + (mL/d)^2)] / (8L)] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$m = (K_h/K_v)^{0.5} =$$

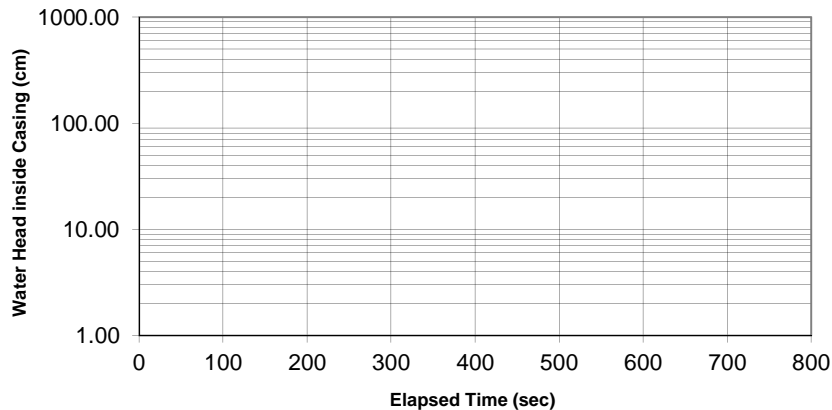
$$K_h = \frac{\ln(H_1/H_2)}{(t_2 - t_1)}$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Kh (cm/s)
	0.0	0	0.00	0.00			SETUP
	2.0	120	0.00	0.00			
	5.0	300	0.00	0.00			
	10.0	600	0.00	0.00			
	15.0	900	0.00	0.00			
	Materials are impermeable - no measurable drop in head was observed						

Notes:

- Soils in test zone are described as: Gray fines with little sand & gravel (Glacial Till).
- The static water level could not be determined at the time of drilling.

Height of Water above Static Water Level on Semilog Scale vs. Time



Kh = Impermeable cm/s

Check m value:

m = _____

Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:

K. Harten

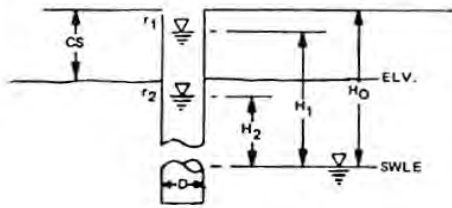
Reviewed by:

Jose A. Ramon

FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 1 CALCULATIONS



$$D = 10.16 \text{ cm}$$

$$CS = 45.72 \text{ cm}$$

$$H_0 = 350.52 \text{ cm (see Note 2)}$$

Project: MassDOT
 Silver Line Extension
 Chelsea, MA
 Project No.: 60242256.1901.01
 Test No.: B-17A
 Test Depth: 4.0 ft.

Calculations:

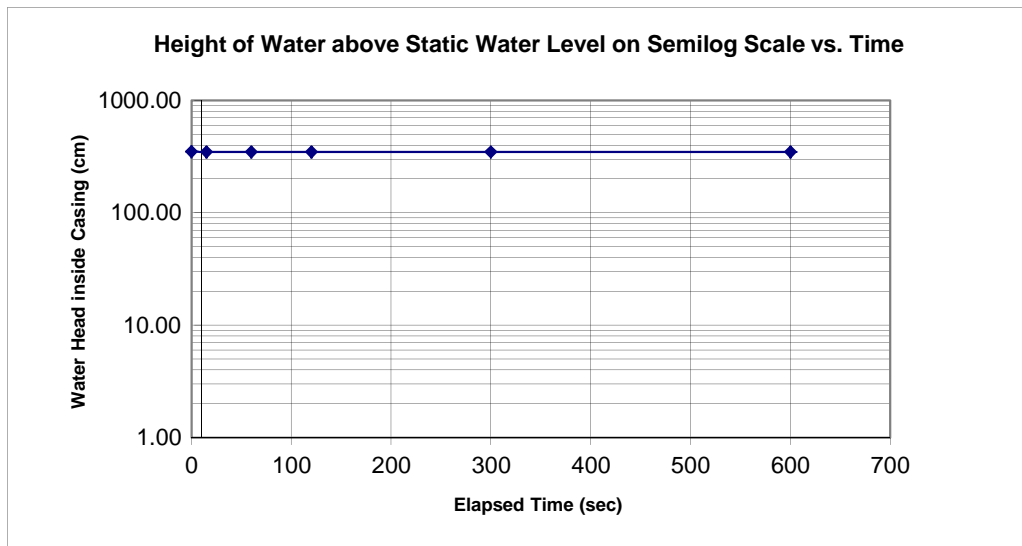
$$K_m = [3.14 \cdot D / 11] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$K_m = 2.90 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Km (cm/s)
							SETUP
	0.00	0	0.000	0.00	350.52	-	-
	0.25	15	0.021	0.64	349.89	1.2E-04	3.5E-04
	1.00	60	0.031	0.95	349.57	2.0E-05	5.9E-05
	2.00	120	0.031	0.95	349.57	Invalid	Invalid
	5.00	300	0.031	0.95	349.57	Invalid	Invalid
	10.00	600	0.031	0.95	349.57	Invalid	Invalid
	15.00	900	0.031	0.95	349.57	Invalid	Invalid
Materials are highly impermeable - a discontinuous drop in head was observed							

Notes:

- Soils in test zone are described as: *Black silty gravel and sand (GM/SM)*.
- The static water level could not be determined at the time of drilling. An assumed static water level depth of 10 feet was used to roughly estimate permeability.

Km = Undetermined cm/s

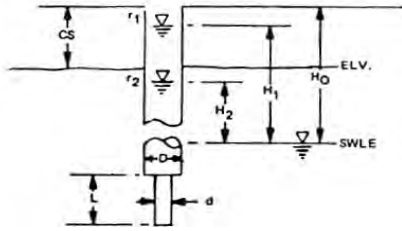
Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:	K. Harten	Reviewed by:	<i>Jose A. Ramon</i>
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FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 2 CALCULATIONS



$d = 5.08$ cm
 $D = 10.16$ cm
 $CS = 45.72$ cm
 $L = 60.96$ cm
 $H_0^* = 350.52$ cm
 (*see Note 2)

Project: MassDOT
 Silver Line Extension
 Chelsea, MA
 Project No.: 60242256.1901.01
 Test No.: **B-17A**
 Test Depth: **4.0 - 6.0 ft.**

Calculations:

$$K_h = [D^2 \cdot \ln[mL/d + \text{SQRT}(1 + (mL/d)^2)] / (8L)] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$m = (K_h/K_v)^{0.5} = 1.000 \text{ (assumed)}$$

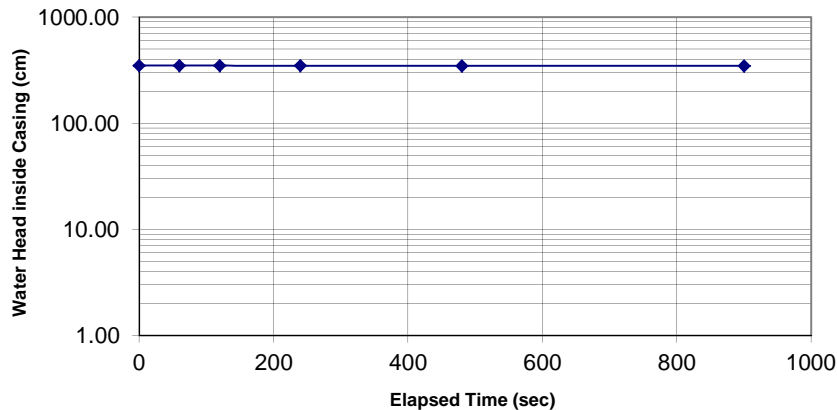
$$K_h = 0.6731 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Kh (cm/s)
							SETUP
	0.0	0	0.00	0.00	350.52	-	-
	1.0	60	0.02	0.48	350.04	2.3E-05	1.5E-05
	2.0	120	0.03	0.95	349.57	2.3E-05	1.5E-05
	4.0	240	0.04	1.11	349.41	3.8E-06	2.5E-06
	8.0	480	0.06	1.75	348.77	7.6E-06	5.1E-06
	15.0	900	0.07	2.22	348.30	3.3E-06	2.2E-06

Notes:

- Soils in test zone are described as: *Black silty gravel and sand (GM/SM)*.
- The static water level could not be determined at the time of drilling. An assumed static water level depth of 10 feet was used in the permeability calculations. The falling head test is assumed to have been performed above the depth of the water table.

Height of Water above Static Water Level on Semilog Scale vs. Time



Check m value: $K_h = 8.1E-06$ cm/s
 $m = 1.000$ (assumed)

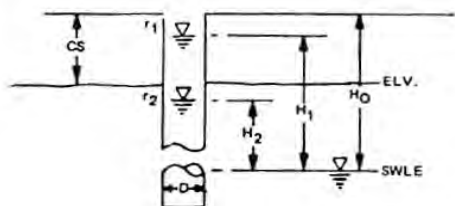
Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:	K. Harten	Reviewed by:	<i>Jose A. Ramon</i>
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FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 1 CALCULATIONS



$$D = 10.16 \text{ cm}$$

$$CS = 45.72 \text{ cm}$$

$$H_0 = 313.94 \text{ cm}$$

Project: MassDOT

Silver Line Extension

Chelsea, MA

Project No.: 60242256.1901.01

Test No.: B-26 Test #1

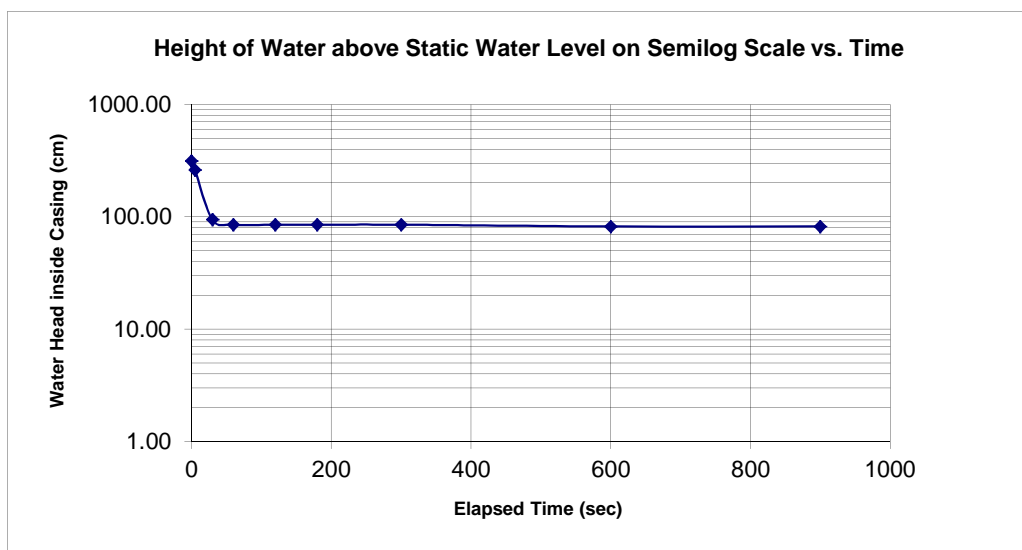
Test Depth: 6.0 ft. (see Note 1)

Calculations:

$$K_m = [3.14 \cdot D / 11] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$K_m = 2.90 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Km (cm/s)
							SETUP
1/20/2014	0.00	0	0.00	0.00	313.94	-	-
	0.08	5	1.70	51.82	262.13	3.6E-02	1.0E-01
	0.50	30	7.20	219.46	94.49	4.1E-02	1.2E-01
	1.00	60	7.50	228.60	85.34	3.4E-03	9.8E-03
	2.00	120	7.50	228.60	85.34	Invalid	Invalid
	3.00	180	7.50	228.60	85.34	Invalid	Invalid
	5.00	300	7.50	228.60	85.34	Invalid	Invalid
	10.00	600	7.60	231.65	82.30	Invalid	Invalid
	15.00	900	7.60	231.65	82.30	Invalid	Invalid
Recorded drops ≥7.5 feet (i.e., the casing length) are erroneous and result in invalid data							
Notes:							
1. Falling head test was performed above depth of water table							
2. Soils in test zone are described as: Tan Sand, some gravel, little silt (SM)							



$$K_m = 1.1E-01 \text{ cm/s}$$

Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:

K. Harten

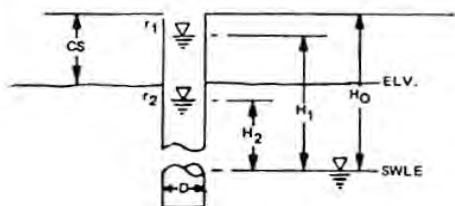
Reviewed by:

Jose A. Ramon

FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 1 CALCULATIONS



$$D = 10.16 \text{ cm}$$

$$CS = 45.72 \text{ cm}$$

$$H_0 = 313.94 \text{ cm}$$

Project: MassDOT

Silver Line Extension

Chelsea, MA

Project No.: 60242256.1901.01

Test No.: B-26 Test #2

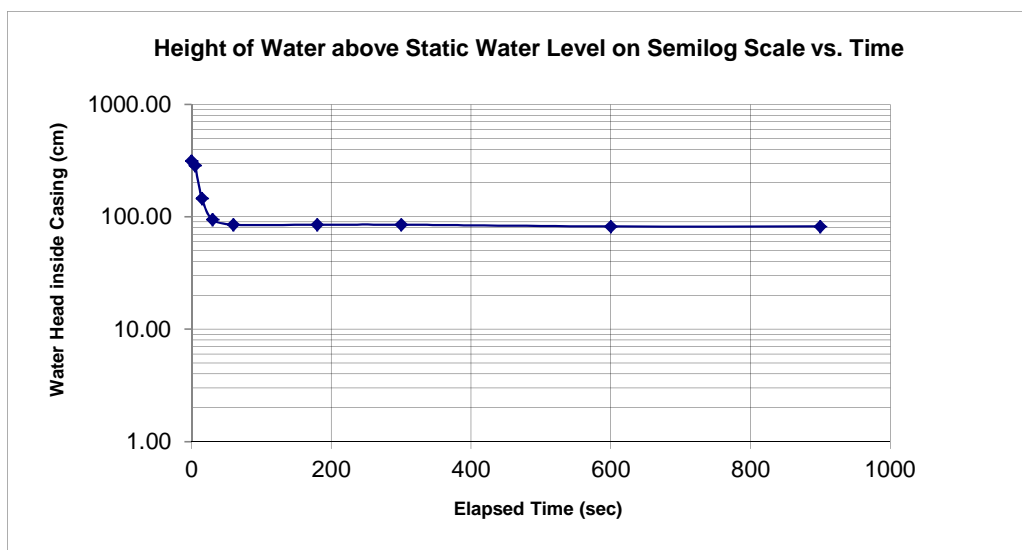
Test Depth: 6.0 ft. (see Note 1)

Calculations:

$$K_m = [3.14 \cdot D / 11] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$K_m = 2.90 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Km (cm/s)
							SETUP
1/20/2014	0.00	0	0.00	0.00	313.94	-	-
	0.08	5	0.90	27.43	286.51	1.8E-02	5.3E-02
	0.25	15	5.50	167.64	146.30	6.7E-02	1.9E-01
	0.50	30	7.20	219.46	94.49	2.9E-02	8.5E-02
	1.00	60	7.50	228.60	85.34	3.4E-03	9.8E-03
	3.00	180	7.50	228.60	85.34	Invalid	Invalid
	5.00	300	7.50	228.60	85.34	Invalid	Invalid
	10.00	600	7.60	231.65	82.30	Invalid	Invalid
	15.00	900	7.60	231.65	82.30	Invalid	Invalid
Recorded drops ≥7.5 feet (i.e., the casing length) are erroneous and result in invalid data							
Notes:							
1. Falling head test was performed above depth of water table							
2. Soils in test zone are described as: Tan Sand, some gravel, little silt (SM)							



$$K_m = 1.1E-01 \text{ cm/s}$$

Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:

K. Harten

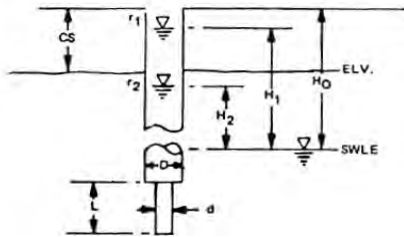
Reviewed by:

Jose A. Ramon

FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 2 CALCULATIONS



$d = 5.08$ cm
 $D = 10.16$ cm
 $CS = 45.72$ cm
 $L = 60.96$ cm (see Note 2)
 $H_0 = 313.94$ cm

Project: MassDOT
 Silver Line Extension
 Chelsea, MA
 Project No.: 60242256.1901.01
 Test No.: B-26
 Test Depth*: 6.0 - 8.0 ft.
 (*see Note 1)

Calculations:

$$K_h = [D^2 * \ln[mL/d + \text{SQRT}(1 + (mL/d)^2)] / (8L)] * \ln(H_1/H_2) / (t_2 - t_1)$$

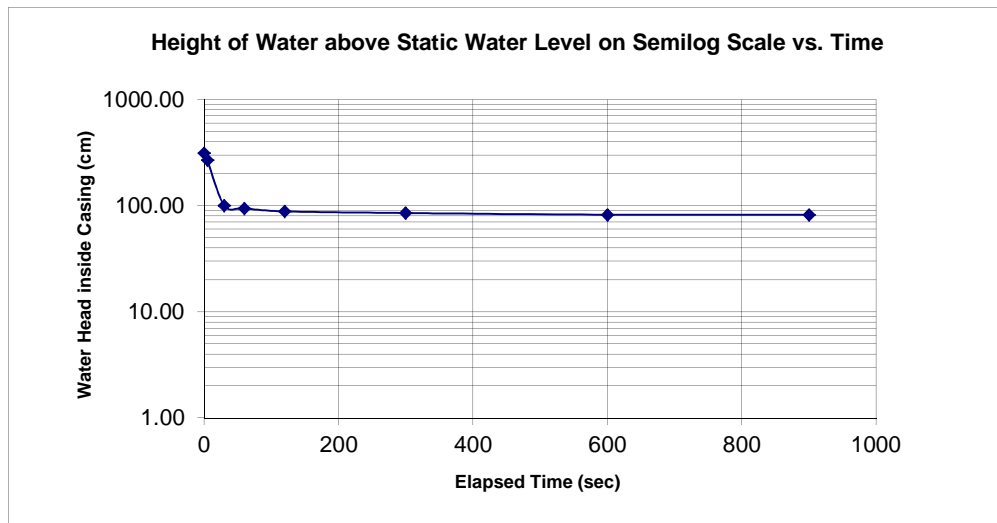
$$m = (K_h/K_v)^{0.5} = 0.02$$

$$K_h = 0.0379 * \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H1/H2)/Δt	Kh (cm/s)
							SETUP
1/20/2014	0.00	0	0.00	0.00	313.94	-	-
	0.08	5	1.50	45.72	268.22	3.1E-02	1.2E-03
	0.50	30	7.00	213.36	100.58	3.9E-02	1.5E-03
	1.00	60	7.20	219.46	94.49	2.1E-03	7.9E-05
	2.00	120	7.40	225.55	88.39	1.1E-03	4.2E-05
	5.00	300	7.50	228.60	85.34	1.9E-04	7.4E-06
	10.00	600	7.60	231.65	82.30	Invalid	Invalid
	15.00	900	7.60	231.65	82.30	Invalid	Invalid
Test conditions are no longer valid once recorded drops exceed 7.5 feet (i.e., the casing length)							

Notes:

1. Falling head test was performed above depth of water table.
2. Soils in test zone are described as: Tan Sand, some gravel, little silt (SM).
3. SPT sample hole collapsed upon spoon retrieval.



Check m value: $K_h = 1.3E-03$ cm/s
 $m = 0.01$

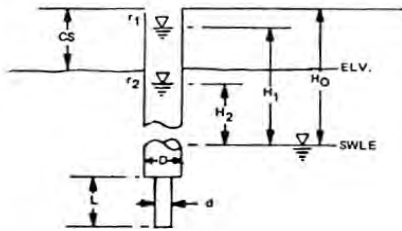
Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:	K. Harten	Reviewed by:	<i>Jose A. Ramon</i>
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FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 2 CALCULATIONS



$d = 5.08$ cm
 $D = 10.16$ cm
 $CS = 45.72$ cm
 $L = 60.96$ cm (see Note 2)
 $H_0 = 335.28$ cm

Project: MassDOT
 Silver Line Extension
 Chelsea, MA
 Project No.: 60242256.1901.01
 Test No.: **B-27 Test #1**
 Test Depth*: **6.0 - 8.0 ft.**
 (*see Note 1)

Calculations:

$$K_h = [D^2 \cdot \ln[mL/d + \text{SQRT}(1 + (mL/d)^2)] / (8L)] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$m = (K_h/K_v)^{0.5} = 1.0 \text{ (assumed)}$$

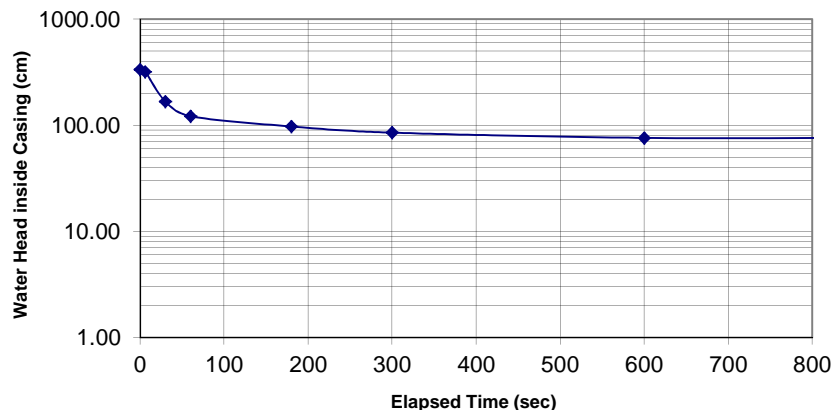
$$K_h = 0.6731 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H ₁ /H ₂)/Δt	K _h (cm/s)
							SETUP
1/23/2014	0.00	0	0.00	0.00	335.28	-	-
	0.10	6	0.50	15.24	320.04	7.8E-03	5.2E-03
	0.50	30	5.50	167.64	167.64	2.7E-02	1.8E-02
	1.00	60	7.00	213.36	121.92	1.1E-02	7.1E-03
	3.00	180	7.80	237.74	97.54	Invalid	Invalid
	5.00	300	8.20	249.94	85.34	Invalid	Invalid
	10.00	600	8.50	259.08	76.20	Invalid	Invalid
	15.00	900	8.50	259.08	76.20	Invalid	Invalid
Test conditions are no longer valid once recorded drops exceed 7.5 feet (i.e., the casing length)							

Notes:

- Falling head test was performed above depth of water table.
- Soils in test zone are described as: Tan Sand, some gravel, few silt.
- The SPT sample hole collapsed to a depth of 8.8 ft. below the top of casing.

Height of Water above Static Water Level on Semilog Scale vs. Time



Check m value: $K_h = \frac{1.0E-02}{m} \text{ cm/s}$
 $m = 1.0 \text{ (assumed)}$

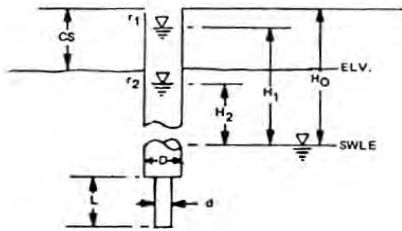
Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:	K. Harten	Reviewed by:	<i>Jose A. Ramon</i>
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FIELD PERMEABILITY - FALLING HEAD TEST

AECOM

STAGE 2 CALCULATIONS



$d = 5.08$ cm
 $D = 10.16$ cm
 $CS = 45.72$ cm
 $L = 60.96$ cm (see Note 2)
 $H_0 = 335.28$ cm

Project: MassDOT
 Silver Line Extension
 Chelsea, MA
 Project No.: 60242256.1901.01
 Test No.: B-27 Test #2
 Test Depth*: 6.0 - 8.0 ft.
 (*see Note 1)

Calculations:

$$K_h = [D^2 \cdot \ln[mL/d + \text{SQRT}(1 + (mL/d)^2)] / (8L)] \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

$$m = (K_h/K_v)^{0.5} = 1.0 \text{ (assumed)}$$

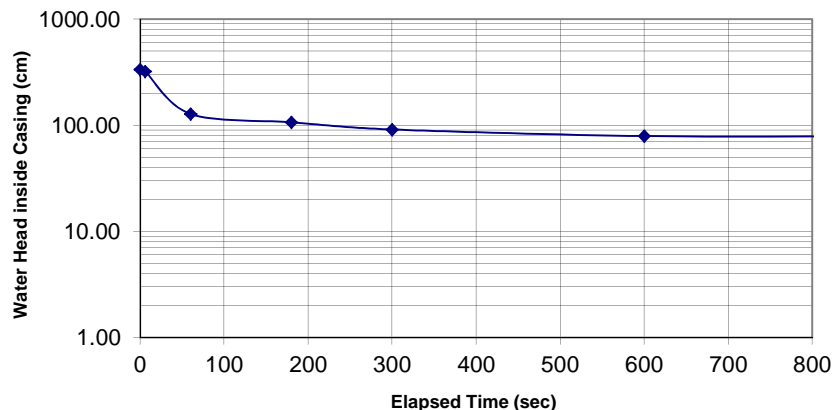
$$K_h = 0.6731 \cdot \ln(H_1/H_2) / (t_2 - t_1)$$

Date	Elapsed Time (min.)	Elapsed Time (sec.)	DROP (ft)	DROP (cm)	H (cm)	LN(H ₁ /H ₂)/Δt	K _h (cm/s)
							SETUP
1/23/2014	0.00	0	0.00	0.00	335.28	-	-
	0.10	6	0.40	12.19	323.09	6.2E-03	4.2E-03
	1.00	60	6.80	207.26	128.02	1.7E-02	1.2E-02
	3.00	180	7.50	228.60	106.68	1.5E-03	1.0E-03
	5.00	300	8.00	243.84	91.44	Invalid	Invalid
	10.00	600	8.40	256.03	79.25	Invalid	Invalid
	15.00	900	8.40	256.03	79.25	Invalid	Invalid
Test conditions are no longer valid once recorded drops exceed 7.5 feet (i.e., the casing length)							

Notes:

- Falling head test was performed above depth of water table.
- Soils in test zone are described as: Tan Sand, some gravel, few silt.
- The SPT sample hole collapsed to a depth of 8.8 ft. below the top of casing.

Height of Water above Static Water Level on Semilog Scale vs. Time



Check m value: $K_h = \frac{5.6E-03}{1.0} \text{ cm/s}$ (assumed)

Comments: Test well installed by Northern Drill Service (T. Tucker). Data recorded by AECOM (W. Checchi)

Prepared by:	K. Harten	Reviewed by:	Jose A. Ramon
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ATTACHMENT 4

GEOTECHNICAL LABORATORY TEST RESULTS



Client:	AECOM				
Project:	Silverline				
Location:	Chelsea, MA				
	Project No: GTX-301232				
Boring ID: ---	Sample Type: ---		Tested By: jek		
Sample ID: ---	Test Date: 12/06/13		Checked By: jdt		
Depth : ---	Test Id: 283988				

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-1	SPT-3	4-6 ft	Moist, light olive brown sandy clay with gravel	7.0	6.7
B-5	SPT-3	4-6 ft	Moist, light yellowish brown clay	6.9	6.4
B-15	SPT-3	4-6 ft	Moist, light olive brown clay with sand and gravel	6.7	7.2

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

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Client:	AECOM				
Project:	Silverline				
Location:	Chelsea, MA				
Project No:	GTX-301232				
Boring ID:	---	Sample Type:	---	Tested By:	jek
Sample ID:	---	Test Date:	12/27/13	Checked By:	jdt
Depth :	---	Test Id:	285442		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-24	SPT-1	2-4 ft	Moist, olive brown clayey sand	5.9	5.5
B-33	SPT-1	2-4 ft	Dry, grayish brown silty sand with gravel	5.9	5.3

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

printed 12/27/2013 11:19:44 AM



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA		Project No: GTX-301232
Boring ID:	B-28	Sample Type:	jar
Sample ID:	SPT-2	Test Date:	01/28/14
Depth :	9-11 ft	Test Id:	287501
Test Comment:	---		
Sample Description:	Moist, brown sand with gravel		
Sample Comment:	---		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-28	SPT-2	9-11 ft	Moist, brown sand with gravel	6.0	5.9

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

printed 1/31/2014 8:00:37 AM



Client:	AECOM				
Project:	Silverline				
Location:	Chelsea, MA				Project No: GTX-301232
Boring ID:	---	Sample Type:	---	Tested By:	jek
Sample ID:	---	Test Date:	01/15/14	Checked By:	jdt
Depth :	---	Test Id:	286941		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-50	Bulk	1-5 ft	Moist, very dark brown silty sand with gravel	5.0	4.2
B-53	SPT-1	6-8 ft	Moist, very dark grayish brown silt with organics	7.1	6.6

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

printed 1/23/2014 9:51:13 AM



Client:	Aecom
Project:	Silverline
Location:	Chelsea, MA
GTX#:	301232
Test Date:	12/06/13
Tested By:	jek
Checked By:	jdt

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G 57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹
B-1	SPT-3	4-6	Moist, light olive brown sandy clay with gravel	2,686	3.72E-04
B-5	SPT-3	4-6	Moist, light yellowish brown clay	2,066	4.84E-04
B-15	SPT-3	4-6	Moist, light olive brown clay with sand and gravel	2,583	3.87E-04

Notes: Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G 57)
Test conducted in standard laboratory atmosphere: 68-73 F



Client:	AECOM
Project:	Silverline
Location:	Chelsea, MA
GTX#:	301232
Test Date:	12/18/13
Tested By:	jek
Checked By:	jdt

**Laboratory Measurement of Soil Resistivity Using
the Wenner Four-Electrode Method by ASTM G 57
(Laboratory Measurement)**

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹
B-24	SPT-1	2-4	Moist, olive brown clayey sand	7,231	1.38E-04
B-33	SPT-1	2-4	Dry, grayish brown silty sand with gravel	11,363	8.80E-05

Notes: Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G 57)
Test conducted in standard laboratory atmosphere: 68-73 F



Client:	AECOM
Project:	Silverline
Location:	Chelsea, MA
GTX#:	301232
Test Date:	01/23/14
Tested By:	jbr
Checked By:	jdt

Laboratory Measurement of Soil Resistivity Using
the Wenner Four-Electrode Method by ASTM G57
(Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹
B-28	SPT-2	9-11	Moist, brown sand with gravel	10,527	9.50E-05

Notes: Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F



Client:	AECOM
Project:	Silverline
Location:	Chlsea, MA
GTX#:	301232
Test Date:	01/10/13
Tested By:	jek
Checked By:	jdt

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

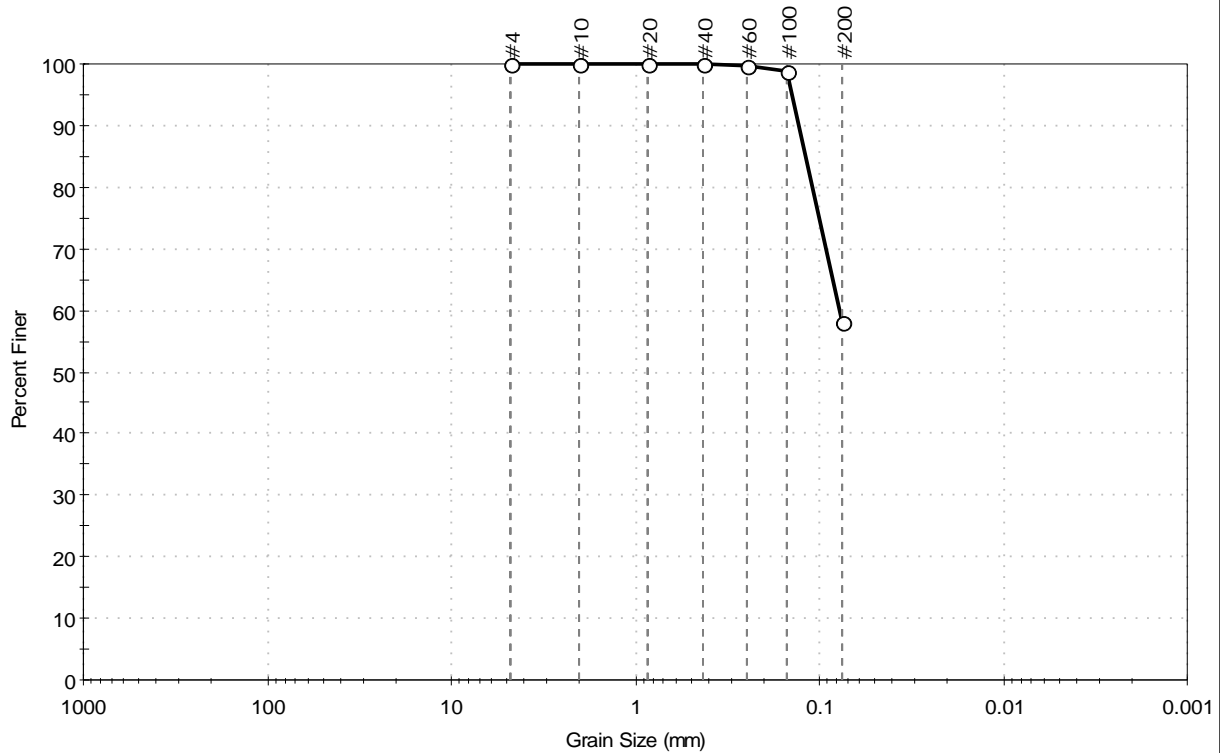
Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹
B-50	Bulk	1-5	Moist, very dark brown silty sand with gravel	30,991	3.23E-05
B-53	SPT-1	6-8	Moist, very dark grayish brown silt with organics	537	1.86E-03

Notes: Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F



Client: AECOM	Project: Silverline	Location: Chelsea, MA	Project No: GTX-301232
Boring ID: B-1	Sample Type: jar	Tested By: jbr	
Sample ID: SPT-6	Test Date: 12/06/13	Checked By: jdt	
Depth : 19-21 ft	Test Id: 283981		
Test Comment: ---			
Sample Description: Moist, very dark olive gray sandy silt			
Sample Comment: ---			

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	41.8	58.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	99		
#200	0.075	58		

Coefficients

D ₈₅ = 0.1185 mm	D ₃₀ = N/A
D ₆₀ = 0.0774 mm	D ₁₅ = N/A
D ₅₀ = N/A	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM Sandy silt (ML)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

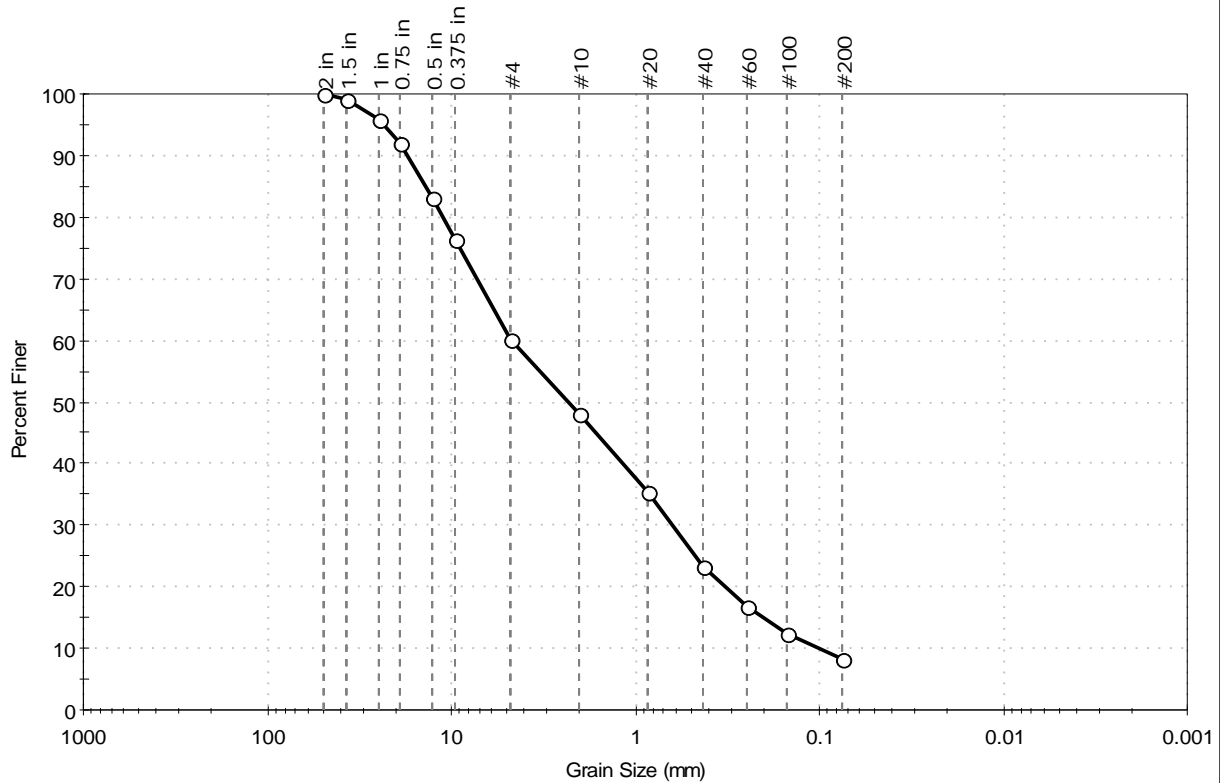
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-3	Sample Type:	bucket
Sample ID:	Bulk	Test Date:	12/20/13
Depth :	0-4 ft	Test Id:	285454
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	39.7	52.0	8.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	99		
1 in	25.00	96		
0.75 in	19.00	92		
0.5 in	12.70	83		
0.375 in	9.50	76		
#4	4.75	60		
#10	2.00	48		
#20	0.85	36		
#40	0.42	23		
#60	0.25	17		
#100	0.15	12		
#200	0.075	8		

Coefficients

D ₈₅ = 13.8664 mm	D ₃₀ = 0.6205 mm
D ₆₀ = 4.6463 mm	D ₁₅ = 0.2011 mm
D ₅₀ = 2.2890 mm	D ₁₀ = 0.0994 mm
C _u = 46.743	C _c = 0.834

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

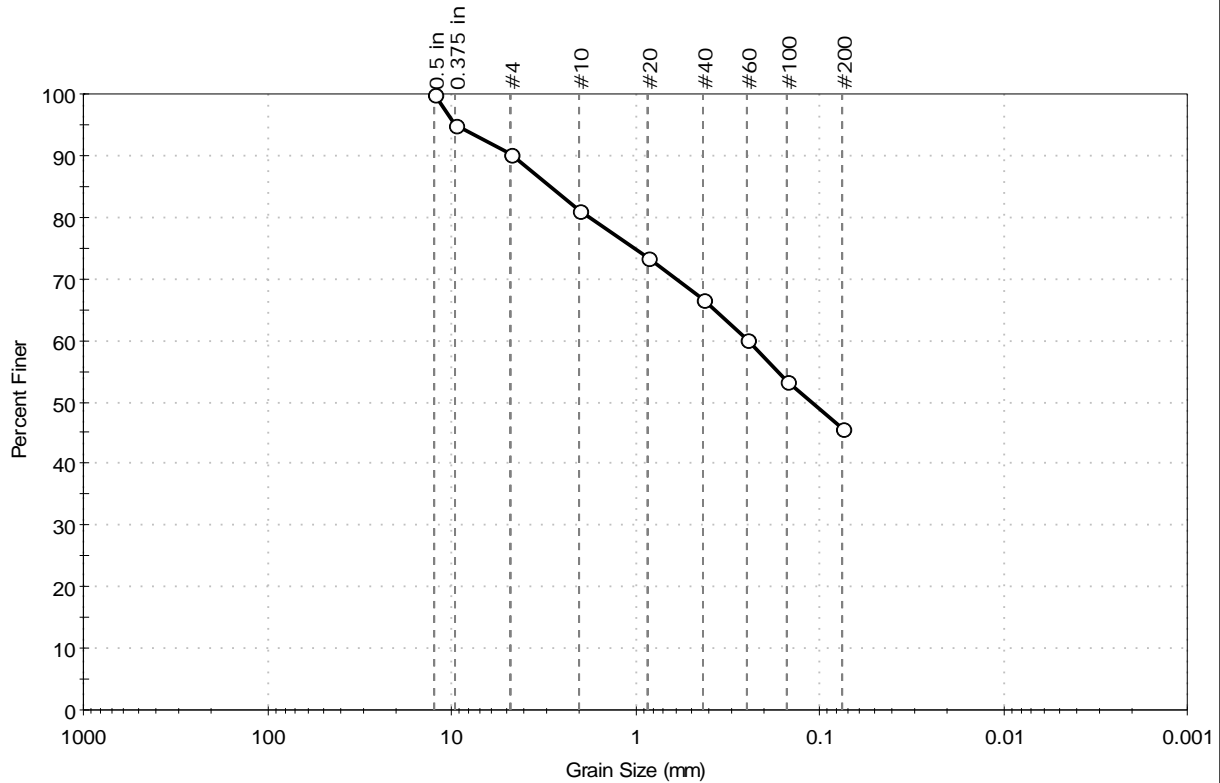
Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-5	Sample Type:	jar
Sample ID:	SPT-6	Test Date:	12/06/13
Depth :	12-14 ft	Test Id:	283982
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, olive gray clayey sand	Checked By:	jdt
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	9.8	44.5	45.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	95		
#4	4.75	90		
#10	2.00	81		
#20	0.85	73		
#40	0.42	67		
#60	0.25	60		
#100	0.15	53		
#200	0.075	46		

Coefficients

D ₈₅ = 2.9021 mm	D ₃₀ = N/A
D ₆₀ = 0.2466 mm	D ₁₅ = N/A
D ₅₀ = 0.1115 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM Clayey sand (SC)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

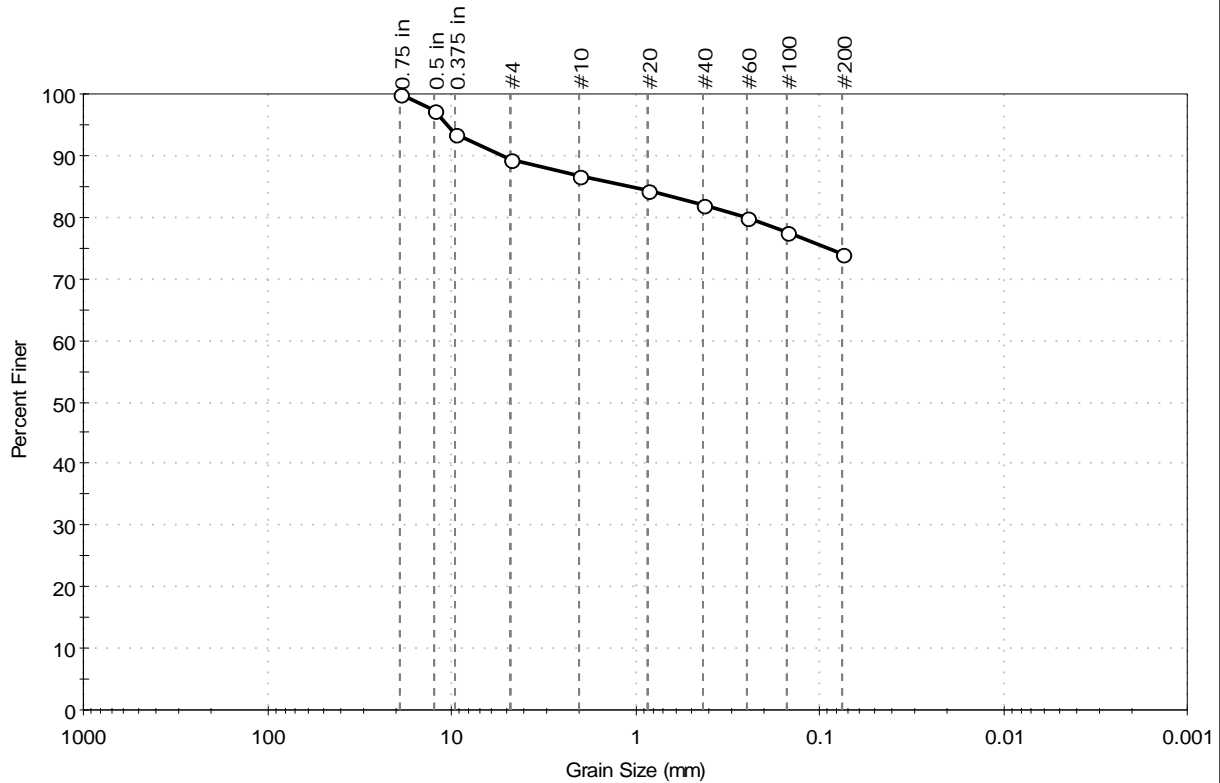
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client: AECOM	Project No: GTX-301232
Project: Silverline	
Location: Chelsea, MA	
Boring ID: B-17	Sample Type: jar
Sample ID: SPT-4	Test Date: 12/06/13
Depth: 9-11 ft	Test Id: 283983
Test Comment: ---	Tested By: jbr
Sample Description: Moist, olive gray clay with sand	Checked By: jdt
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	10.6	15.4	74.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	97		
0.375 in	9.50	93		
#4	4.75	89		
#10	2.00	87		
#20	0.85	84		
#40	0.42	82		
#60	0.25	80		
#100	0.15	78		
#200	0.075	74		

Coefficients

D ₈₅ = 1.0344 mm	D ₃₀ = N/A
D ₆₀ = N/A	D ₁₅ = N/A
D ₅₀ = N/A	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM lean clay with sand (CL)

AASHTO Clayey Soils (A-6 (10))

Sample/Test Description

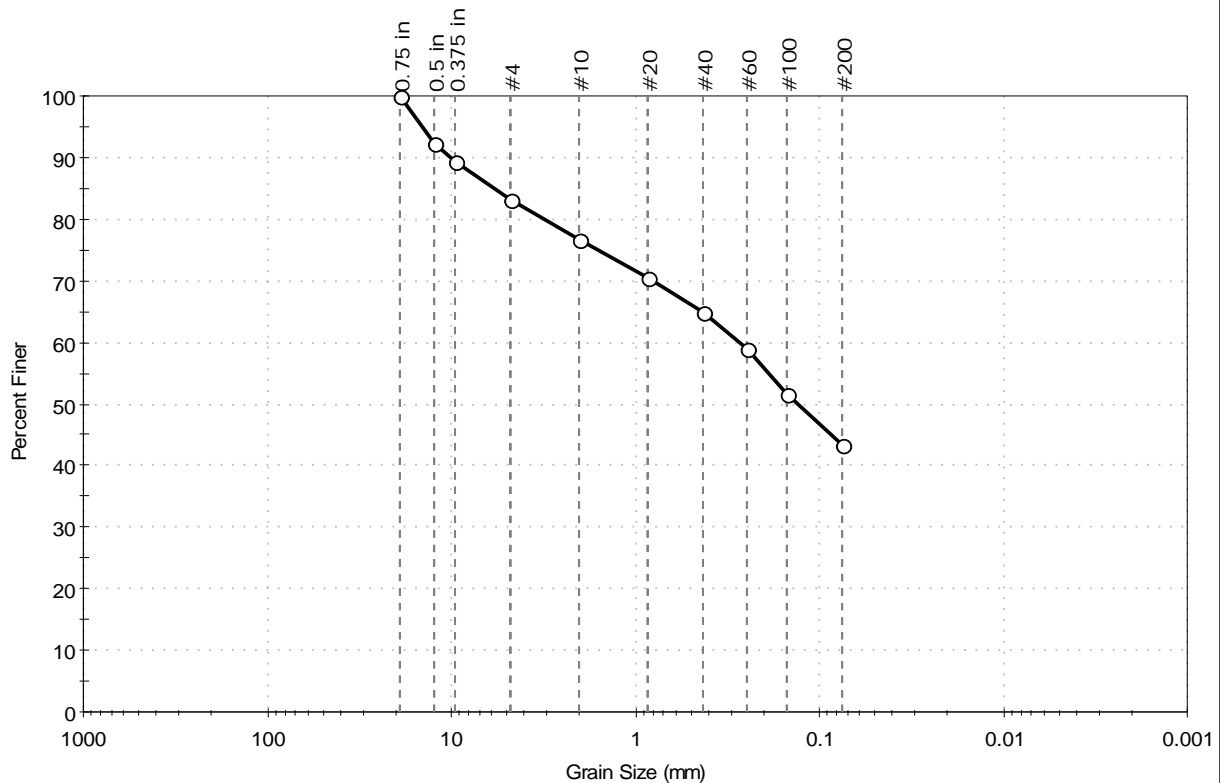
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client: AECOM	Project No: GTX-301232
Project: Silverline	
Location: Chelsea, MA	
Boring ID: B-18	Sample Type: jar
Sample ID: SPT-5	Test Date: 01/15/14
Depth: 19-21 ft	Test Id: 286936
Test Comment: ---	Tested By: jbr
Sample Description: Moist, greenish gray clayey sand with gravel	Checked By: jdt
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	16.8	39.7	43.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	92		
0.375 in	9.50	89		
#4	4.75	83		
#10	2.00	77		
#20	0.85	71		
#40	0.425	65		
#60	0.25	59		
#100	0.15	52		
#200	0.075	43		

Coefficients

D ₈₅ = 5.8445 mm	D ₃₀ = N/A
D ₆₀ = 0.2752 mm	D ₁₅ = N/A
D ₅₀ = 0.1301 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM Clayey sand with gravel (SC)

AASHTO Silty Soils (A-4 (1))

Sample/Test Description

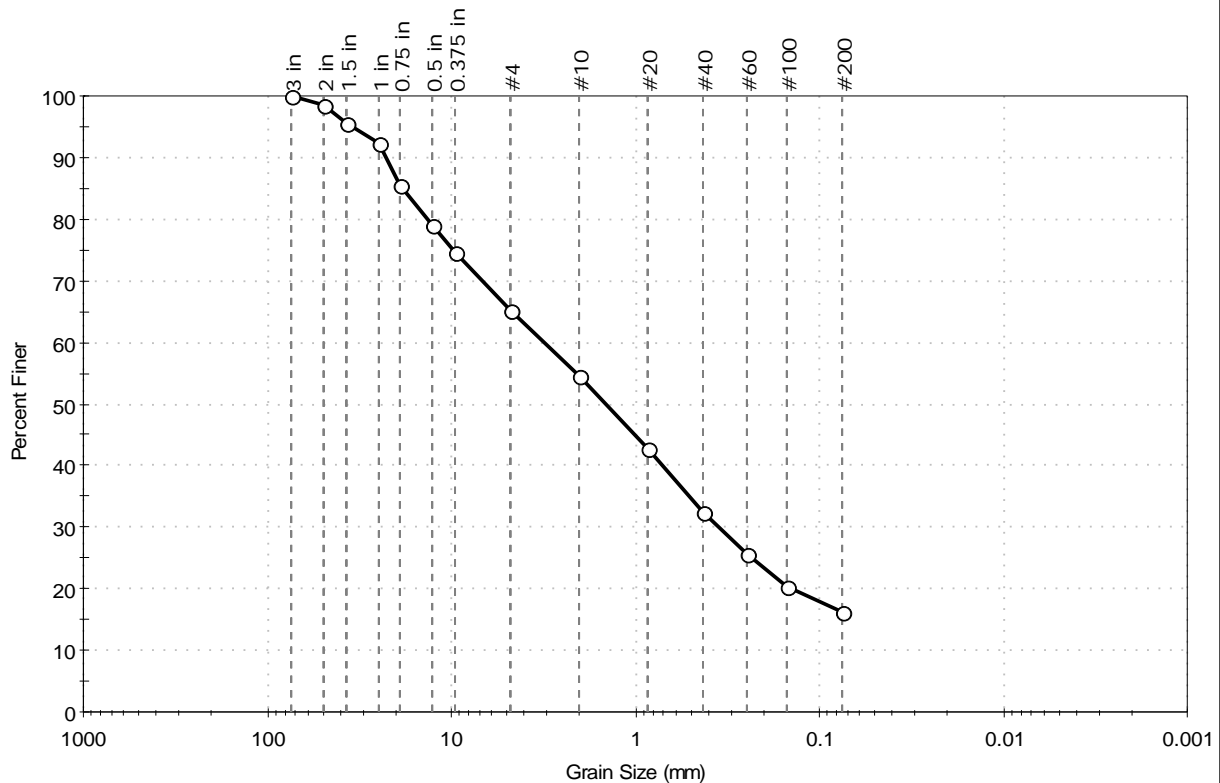
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-21	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/15/14
Depth :	0-10 ft	Test Id:	286921
Test Comment:	---		
Sample Description:	Moist, very dark gray silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	34.8	49.0	16.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	99		
1.5 in	37.50	96		
1 in	25.00	92		
0.75 in	19.00	86		
0.5 in	12.70	79		
0.375 in	9.50	75		
#4	4.75	65		
#10	2.00	55		
#20	0.85	43		
#40	0.42	33		
#60	0.25	26		
#100	0.15	20		
#200	0.075	16		

Coefficients

D ₈₅ = 18.2321 mm	D ₃₀ = 0.3487 mm
D ₆₀ = 3.1170 mm	D ₁₅ = N/A
D ₅₀ = 1.4336 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

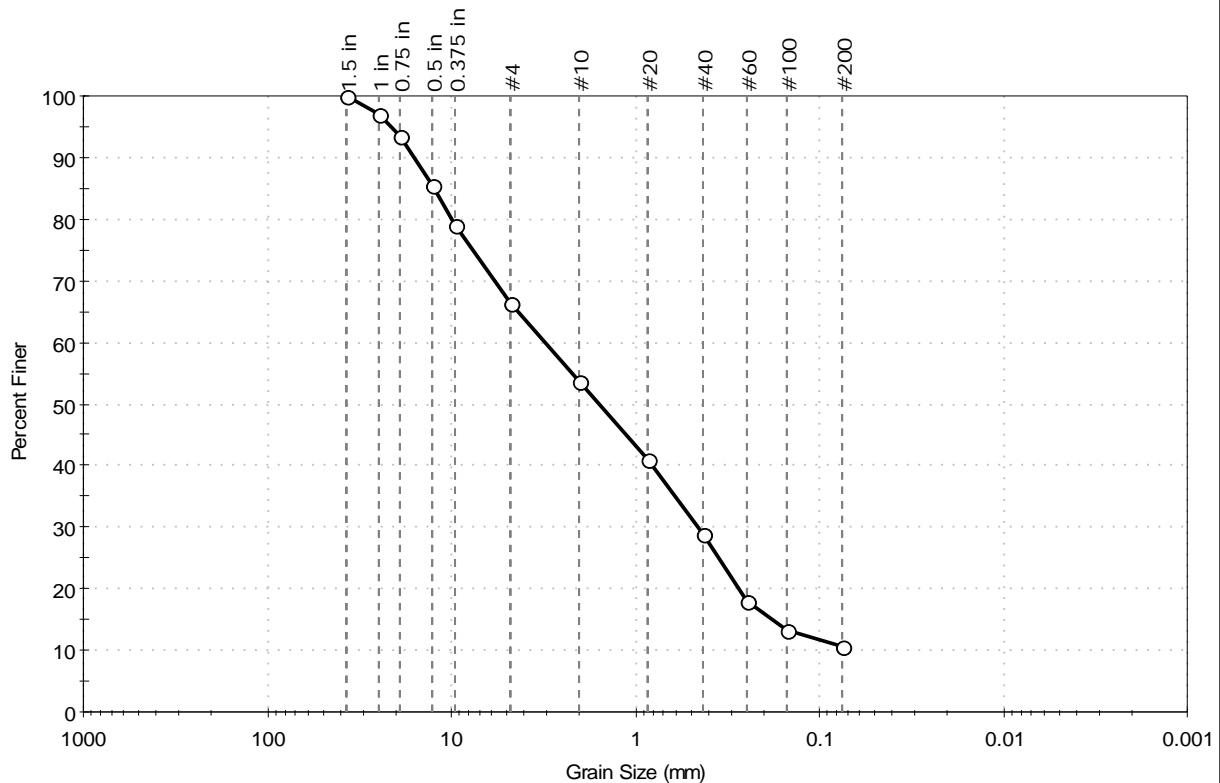
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-26	Sample Type:	bucket
Sample ID:	Bulk (B26A / B26)	Test Date:	02/12/14
Depth :	1-4 ft	Test Id:	288468
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	33.6	55.6	10.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	97		
0.75 in	19.00	94		
0.5 in	12.70	85		
0.375 in	9.50	79		
#4	4.75	66		
#10	2.00	54		
#20	0.85	41		
#40	0.42	29		
#60	0.25	18		
#100	0.15	13		
#200	0.075	11		

Coefficients

D ₈₅ = 12.4412 mm	D ₃₀ = 0.4503 mm
D ₆₀ = 3.0602 mm	D ₁₅ = 0.1799 mm
D ₅₀ = 1.5470 mm	D ₁₀ = 0.0615 mm
C _u = 49.759	C _c = 1.077

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

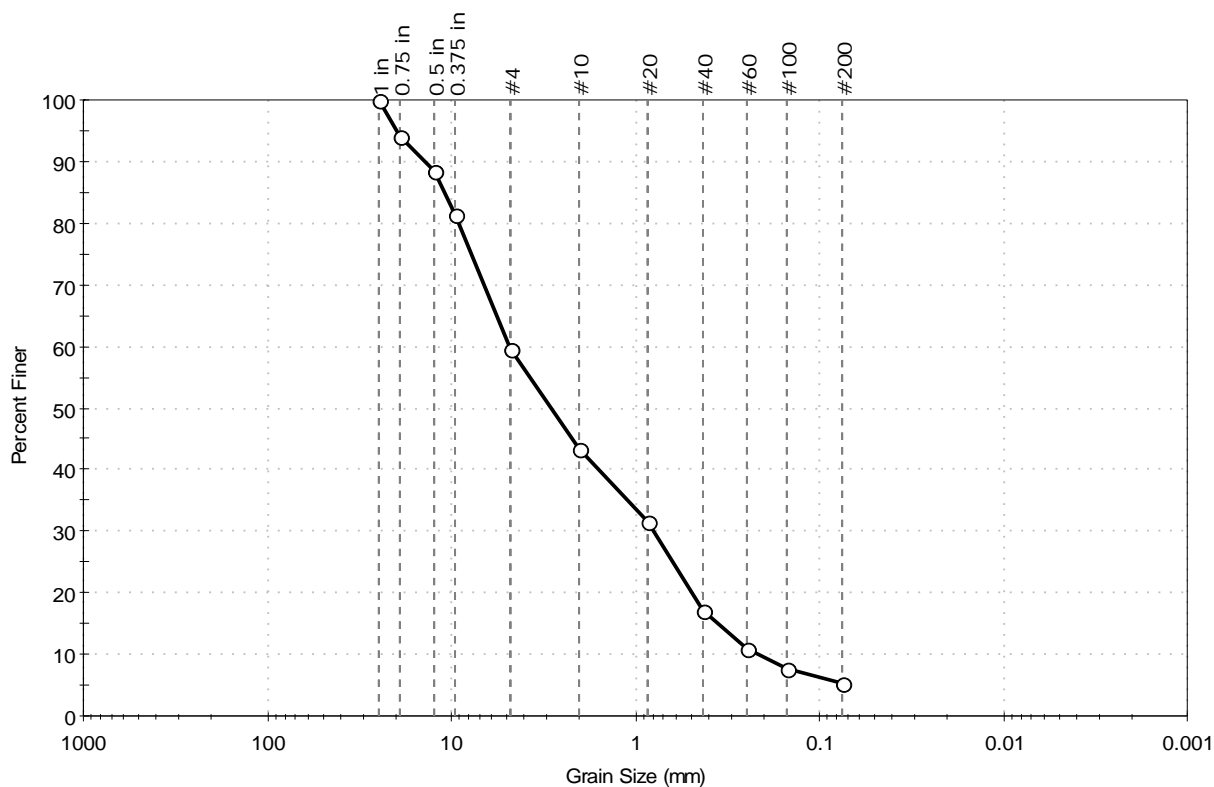
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client: AECOM	Project No: GTX-301232
Project: Silverline	
Location: Chelsea, MA	
Boring ID: B-28A	Sample Type: jar
Sample ID: SPT-4	Test Date: 01/24/14
Depth: 19-21 ft	Test Id: 287500
Test Comment: ---	Tested By: jbr
Sample Description: Moist, light olive brown sand with silt and gravel	Checked By: jdt
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	40.4	54.2	5.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	94		
0.5 in	12.50	88		
0.375 in	9.50	82		
#4	4.75	60		
#10	2.00	43		
#20	0.85	31		
#40	0.42	17		
#60	0.25	11		
#100	0.15	8		
#200	0.075	5		

Coefficients

D ₈₅ = 10.9185 mm	D ₃₀ = 0.7924 mm
D ₆₀ = 4.8119 mm	D ₁₅ = 0.3524 mm
D ₅₀ = 2.8567 mm	D ₁₀ = 0.2154 mm
C _u = 22.339	C _c = 0.606

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

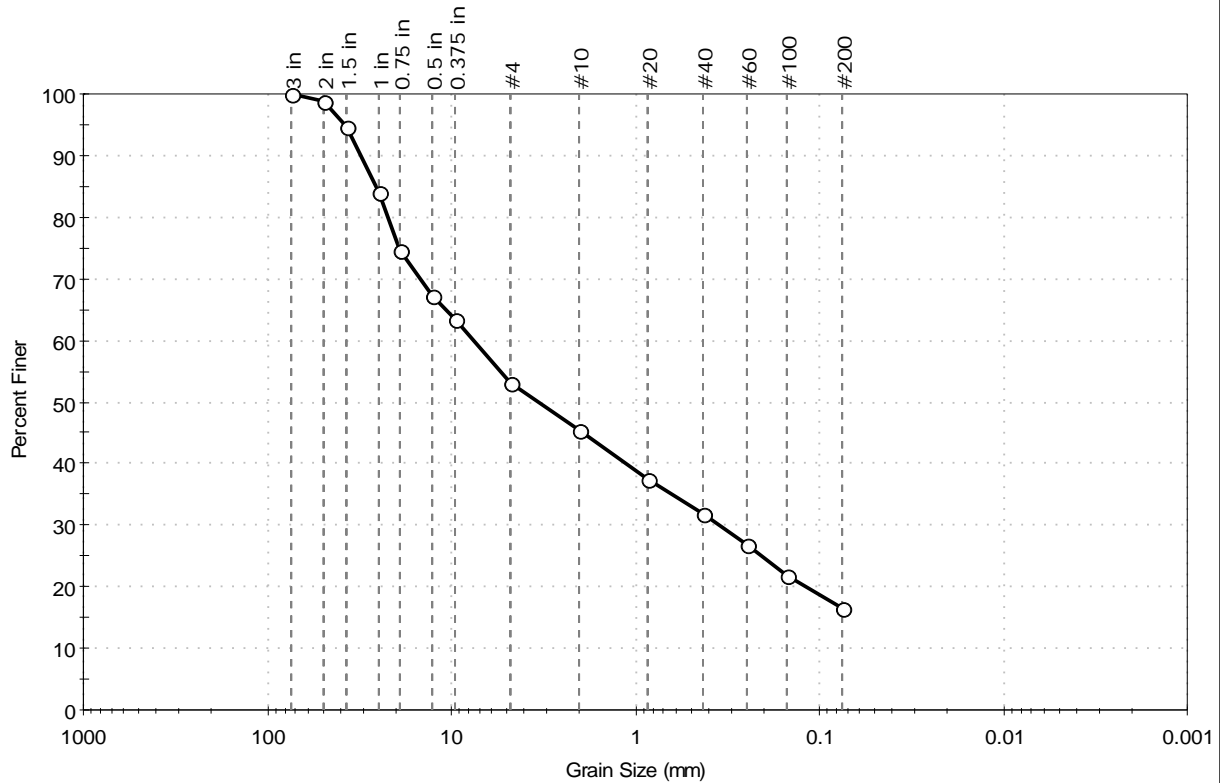
Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-30	Sample Type:	bucket
Sample ID:	Bulk (B31 / B32)	Test Date:	02/12/14
Depth :	1-3 ft	Test Id:	288469
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, black silty gravel with sand	Checked By:	jdt
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	46.8	36.7	16.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	99		
1.5 in	37.50	95		
1 in	25.00	84		
0.75 in	19.00	75		
0.5 in	12.70	67		
0.375 in	9.50	63		
#4	4.75	53		
#10	2.00	46		
#20	0.85	38		
#40	0.42	32		
#60	0.25	27		
#100	0.15	22		
#200	0.075	16		

Coefficients

D ₈₅ = 25.7992 mm	D ₃₀ = 0.3487 mm
D ₆₀ = 7.5245 mm	D ₁₅ = N/A
D ₅₀ = 3.3132 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

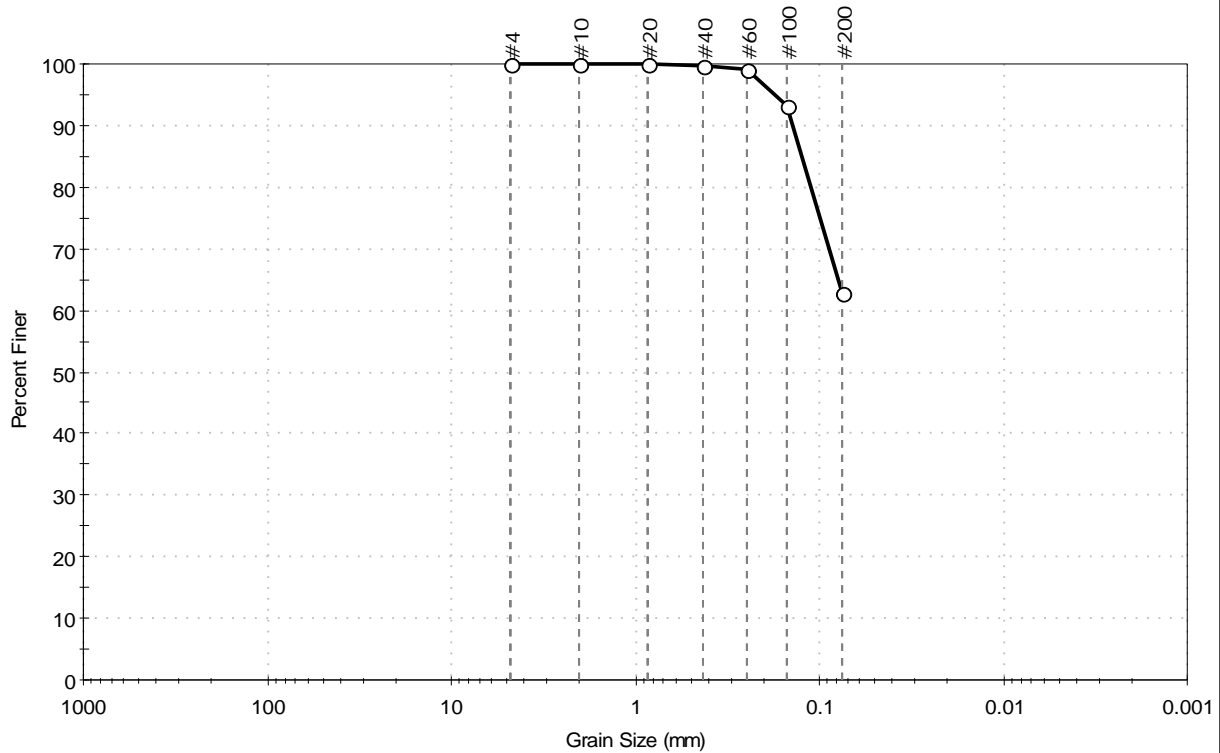
Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client: AECOM	Project: Silverline	Location: Chelsea, MA	Project No: GTX-301232
Boring ID: B-33	Sample Type: jar	Tested By: jbr	
Sample ID: SPT-6	Test Date: 12/23/13	Checked By: jdt	
Depth : 24-26 ft	Test Id: 285453		
Test Comment: ---			
Sample Description: Moist, olive brown sandy silt			
Sample Comment: ---			

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	37.3	62.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	93		
#200	0.075	63		

Coefficients

D ₈₅ = 0.1246 mm	D ₃₀ = N/A
D ₆₀ = N/A	D ₁₅ = N/A
D ₅₀ = N/A	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

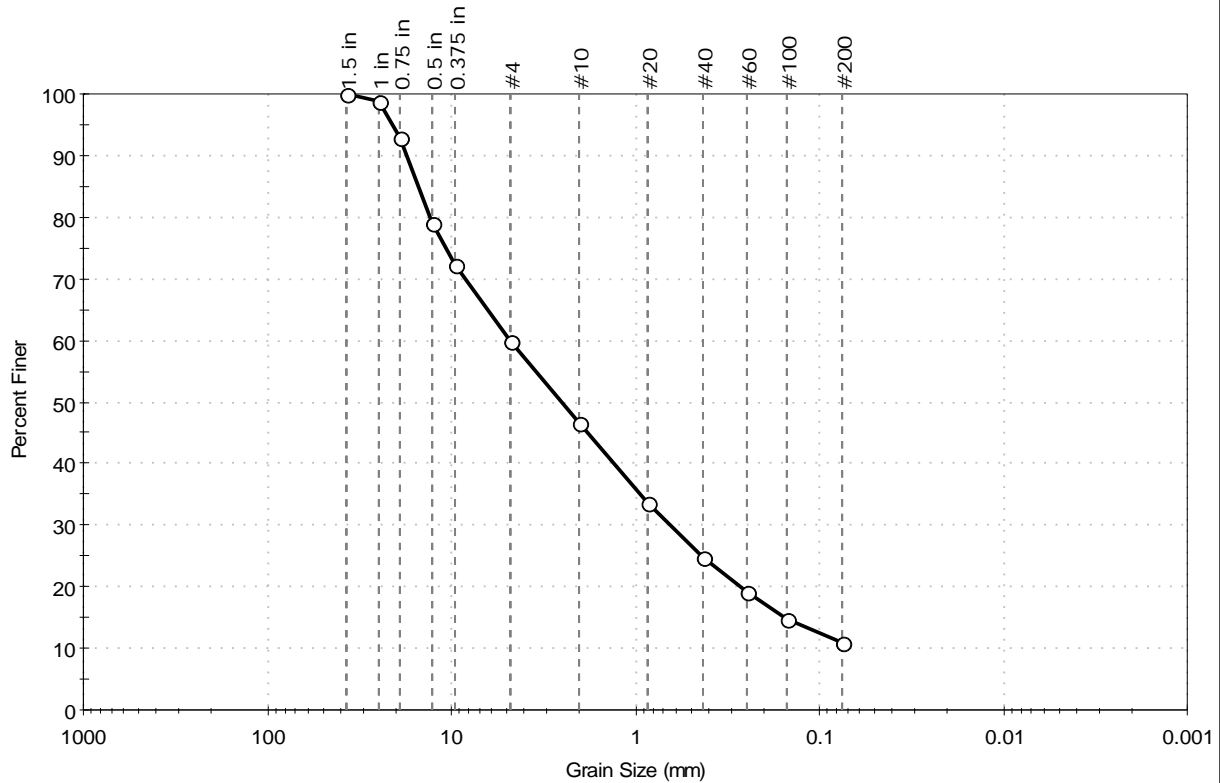
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-37	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/15/14
Depth :	1-5 ft	Test Id:	286920
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, dark grayish brown sand with silt and gravel	Checked By:	jdt
Sample Comment:	----		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	40.0	49.2	10.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	99		
0.75 in	19.00	93		
0.5 in	12.70	79		
0.375 in	9.50	72		
#4	4.75	60		
#10	2.00	46		
#20	0.85	34		
#40	0.42	25		
#60	0.25	19		
#100	0.15	15		
#200	0.075	11		

Coefficients

D ₈₅ = 15.1130 mm	D ₃₀ = 0.6408 mm
D ₆₀ = 4.7508 mm	D ₁₅ = 0.1519 mm
D ₅₀ = 2.5044 mm	D ₁₀ = 0.0657 mm
C _u = 72.311	C _c = 1.316

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

Sample/Test Description

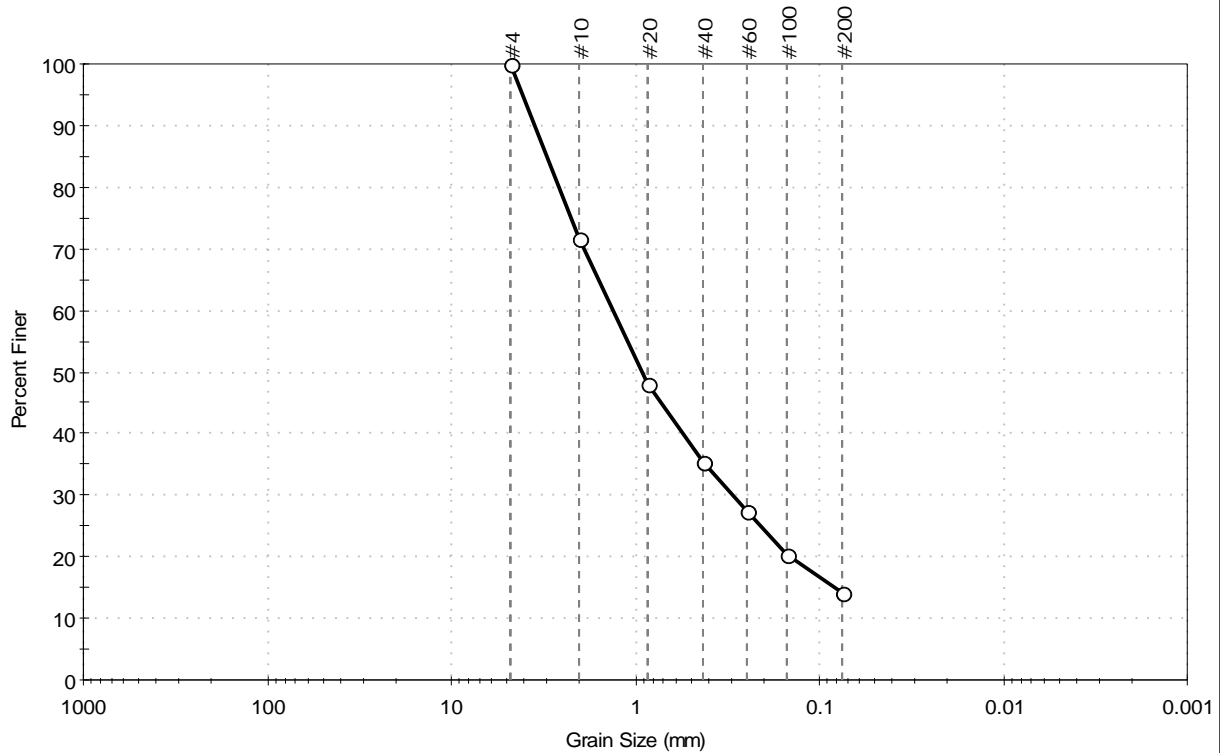
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client: AECOM	Project No: GTX-301232
Project: Silverline	
Location: Chelsea, MA	
Boring ID: B-38	Sample Type: jar
Sample ID: SPT-2	Test Date: 01/15/14
Depth: 10-12 ft	Test Id: 286935
Test Comment: ---	Tested By: jbr
Sample Description: Moist, dark brown silty sand with organics	Checked By: jdt
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	85.9	14.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	72		
#20	0.85	48		
#40	0.42	36		
#60	0.25	27		
#100	0.15	20		
#200	0.075	14		

Coefficients

D ₈₅ = 3.0041 mm	D ₃₀ = 0.2964 mm
D ₆₀ = 1.3068 mm	D ₁₅ = 0.0829 mm
D ₅₀ = 0.9077 mm	D ₁₀ = 0.0481 mm
C _u = 27.168	C _c = 1.398

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

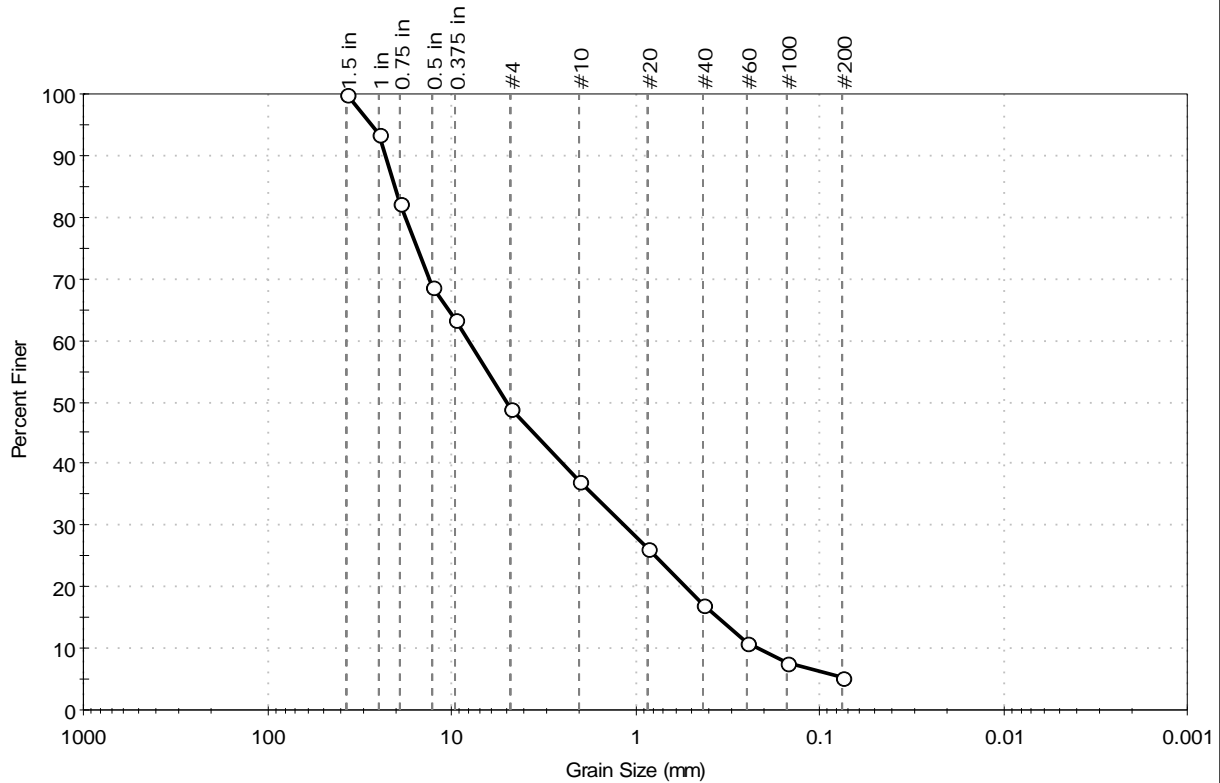
Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : SOFT



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-39	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/15/14
Depth :	1-5 ft	Test Id:	286919
Test Comment:	---		
Sample Description:	Moist, very dark grayish brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	51.0	43.7	5.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	94		
0.75 in	19.00	82		
0.5 in	12.70	69		
0.375 in	9.50	63		
#4	4.75	49		
#10	2.00	37		
#20	0.85	26		
#40	0.42	17		
#60	0.25	11		
#100	0.15	8		
#200	0.075	5		

Coefficients

D ₈₅ = 20.2439 mm	D ₃₀ = 1.1470 mm
D ₆₀ = 8.0919 mm	D ₁₅ = 0.3514 mm
D ₅₀ = 4.9903 mm	D ₁₀ = 0.2149 mm
C _u = 37.654	C _c = 0.757

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

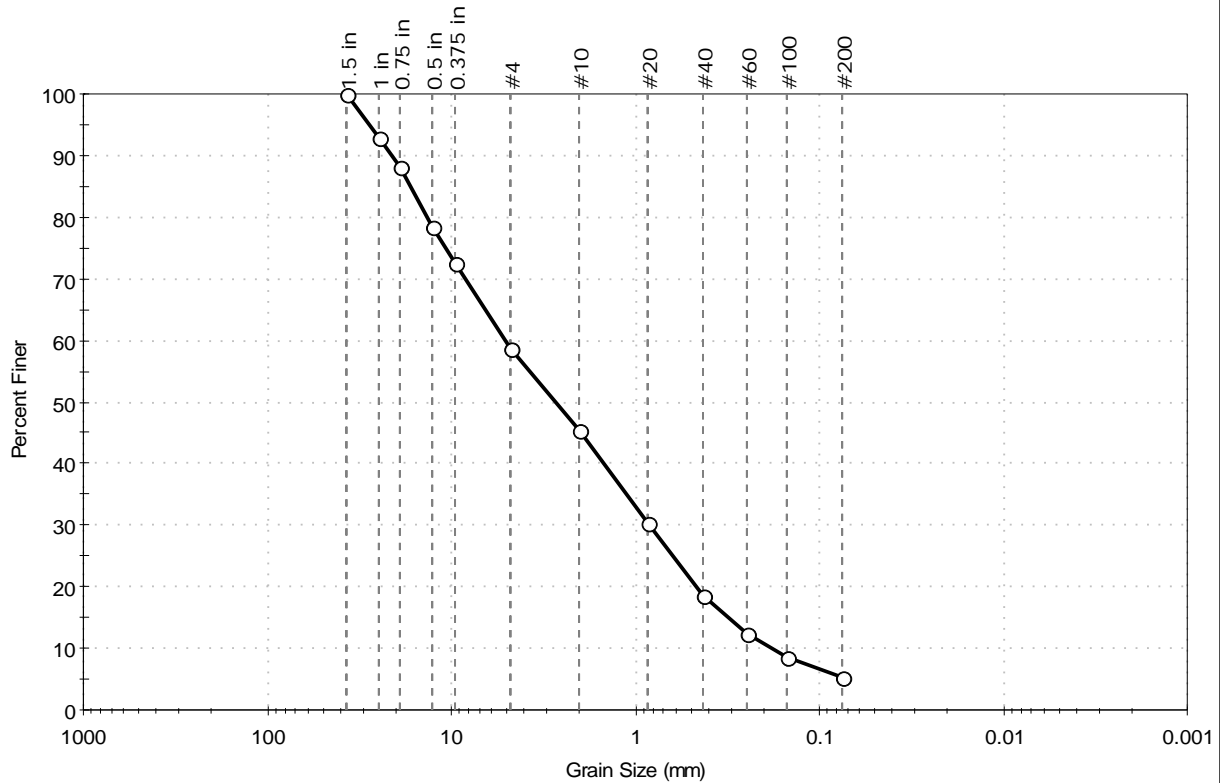
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-41	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/15/14
Depth :	1-5 ft	Test Id:	286918
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	41.3	53.2	5.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	93		
0.75 in	19.00	88		
0.5 in	12.70	79		
0.375 in	9.50	73		
#4	4.75	59		
#10	2.00	45		
#20	0.85	30		
#40	0.42	19		
#60	0.25	12		
#100	0.15	8		
#200	0.075	5		

Coefficients

D ₈₅ = 16.6075 mm	D ₃₀ = 0.8282 mm
D ₆₀ = 5.0819 mm	D ₁₅ = 0.3139 mm
D ₅₀ = 2.6934 mm	D ₁₀ = 0.1852 mm
C _u = 27.440	C _c = 0.729

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

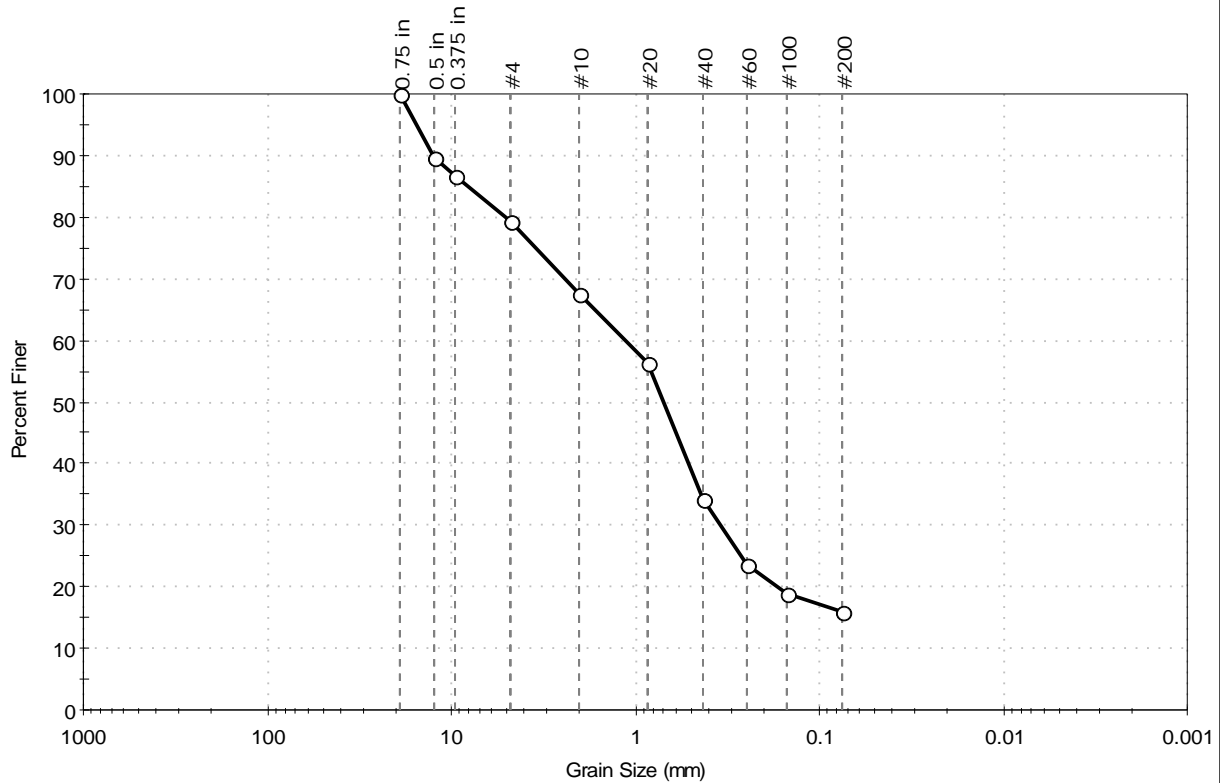
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client: AECOM	Project: Silverline	Location: Chelsea, MA	Project No: GTX-301232
Boring ID: B-44	Sample Type: jar	Tested By: jbr	
Sample ID: SPT-1	Test Date: 01/24/14	Checked By: jdt	
Depth : 6-8 ft	Test Id: 287516		
Test Comment: ---			
Sample Description: Moist, yellowish brown silty, clayey sand with gravel			
Sample Comment: ---			

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	20.5	63.5	16.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	90		
0.375 in	9.50	87		
#4	4.75	79		
#10	2.00	68		
#20	0.85	56		
#40	0.42	34		
#60	0.25	24		
#100	0.15	19		
#200	0.075	16		

Coefficients

D ₈₅ = 7.9938 mm	D ₃₀ = 0.3433 mm
D ₆₀ = 1.1164 mm	D ₁₅ = N/A
D ₅₀ = 0.6948 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM Silty, clayey sand with gravel (SC-SM)

AASHTO Clayey Gravel and Sand (A-2-7 (0))

Sample/Test Description

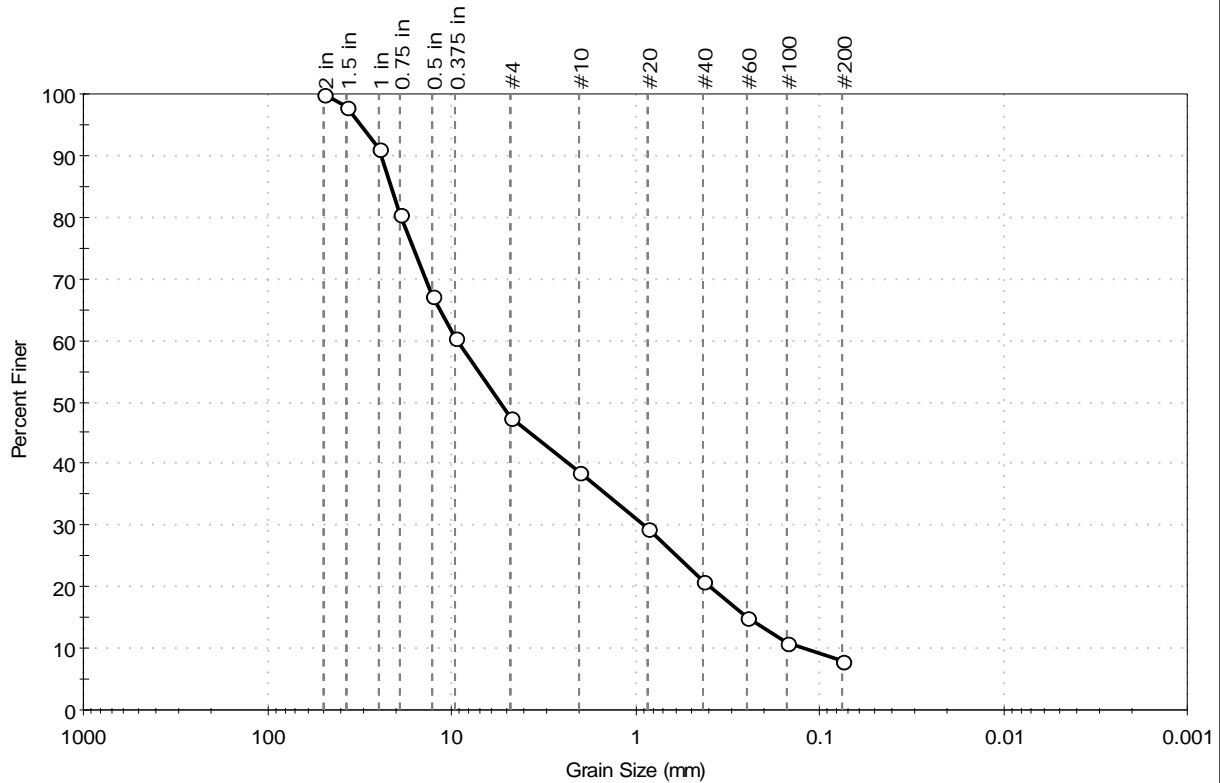
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-48	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/17/14
Depth :	1-5 ft	Test Id:	286917
Test Comment:	---		
Sample Description:	Moist, very dark gray gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	52.5	39.6	7.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	98		
1 in	25.00	91		
0.75 in	19.00	81		
0.5 in	12.70	67		
0.375 in	9.50	61		
#4	4.75	47		
#10	2.00	39		
#20	0.85	29		
#40	0.42	21		
#60	0.25	15		
#100	0.15	11		
#200	0.075	8		

Coefficients

D ₈₅ = 21.3111 mm	D ₃₀ = 0.8978 mm
D ₆₀ = 9.2491 mm	D ₁₅ = 0.2515 mm
D ₅₀ = 5.4382 mm	D ₁₀ = 0.1218 mm
C _u = 75.937	C _c = 0.716

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

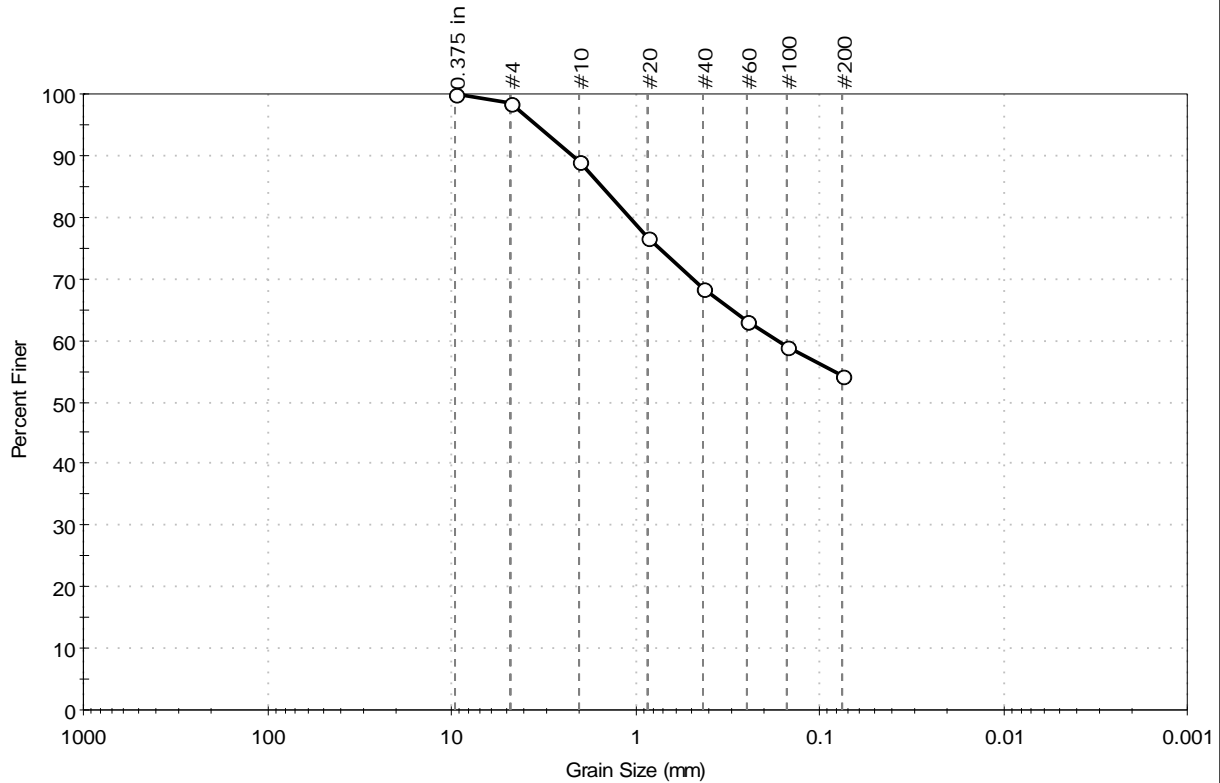
Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client: AECOM	Project No: GTX-301232
Project: Silverline	
Location: Chelsea, MA	
Boring ID: B-52	Sample Type: jar
Sample ID: SPT-1	Test Date: 01/27/14
Depth: 6-8 ft	Test Id: 287515
Test Comment: ---	Tested By: jbr
Sample Description: Wet, very dark brown sandy silt	Checked By: jdt
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	1.6	44.1	54.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	89		
#20	0.85	77		
#40	0.42	69		
#60	0.25	63		
#100	0.15	59		
#200	0.075	54		

Coefficients

D ₈₅ = 1.5172 mm	D ₃₀ = N/A
D ₆₀ = 0.1695 mm	D ₁₅ = N/A
D ₅₀ = N/A	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM Sandy elastic silt (MH)

AASHTO Clayey Soils (A-7-5 (13))

Sample/Test Description

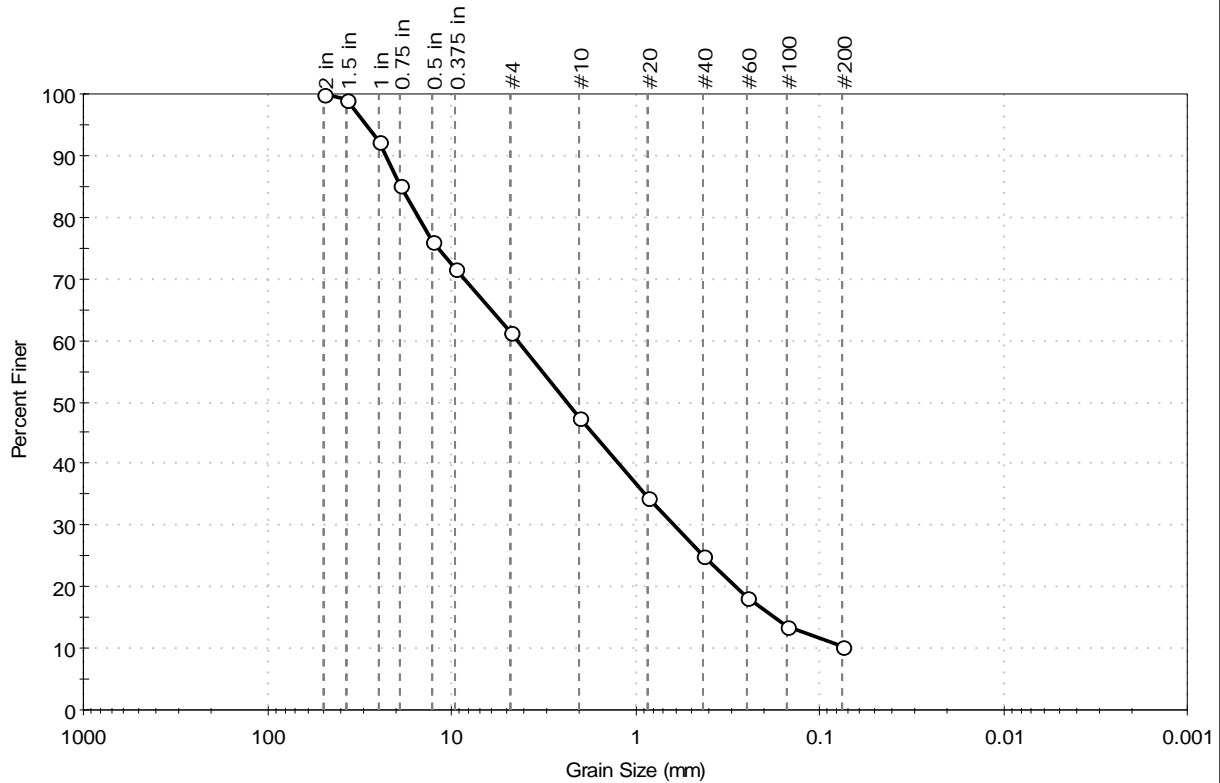
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-57	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/17/14
Depth :	1-5 ft	Test Id:	286916
Test Comment:	---	Tested By:	jbr
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	38.6	51.2	10.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	99		
1 in	25.00	92		
0.75 in	19.00	85		
0.5 in	12.70	76		
0.375 in	9.50	72		
#4	4.75	61		
#10	2.00	48		
#20	0.85	35		
#40	0.42	25		
#60	0.25	18		
#100	0.15	13		
#200	0.075	10		

Coefficients

D ₈₅ = 18.7827 mm	D ₃₀ = 0.6061 mm
D ₆₀ = 4.3452 mm	D ₁₅ = 0.1766 mm
D ₅₀ = 2.3218 mm	D ₁₀ = 0.0712 mm
C _u = 61.028	C _c = 1.187

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

Sample/Test Description

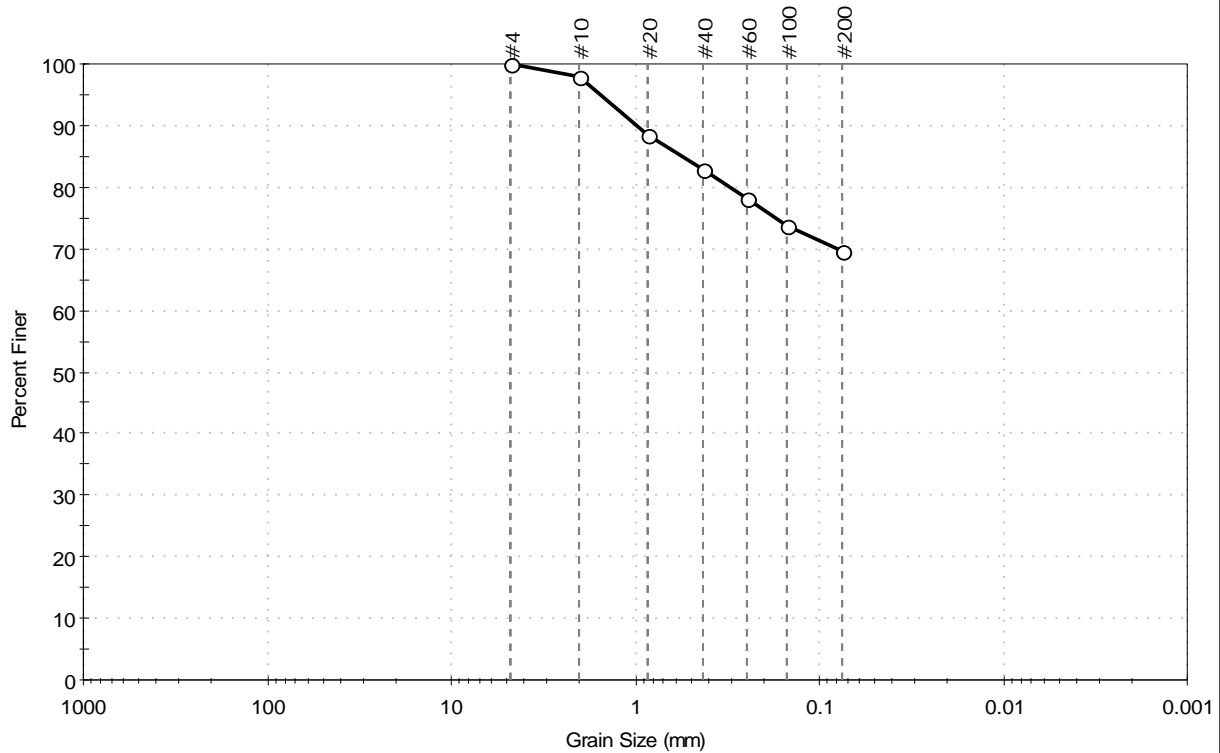
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD



Client: AECOM	Project: Silverline	Location: Chelsea, MA	Project No: GTX-301232
Boring ID: B-59	Sample Type: jar	Tested By: jbr	
Sample ID: SPT-2	Test Date: 01/27/14	Checked By: jdt	
Depth: 10-12 ft	Test Id: 287517		
Test Comment: ---			
Sample Description: Moist, very dark brown sandy organic silt			
Sample Comment: ---			

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	30.3	69.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	98		
#20	0.85	88		
#40	0.42	83		
#60	0.25	78		
#100	0.15	74		
#200	0.075	70		

Coefficients

D ₈₅ = 0.5580 mm	D ₃₀ = N/A
D ₆₀ = N/A	D ₁₅ = N/A
D ₅₀ = N/A	D ₁₀ = N/A
C _u = N/A	C _c = N/A

Classification

ASTM Sandy organic silt (OH)

AASHTO Clayey Soils (A-7-5 (72))

Sample/Test Description

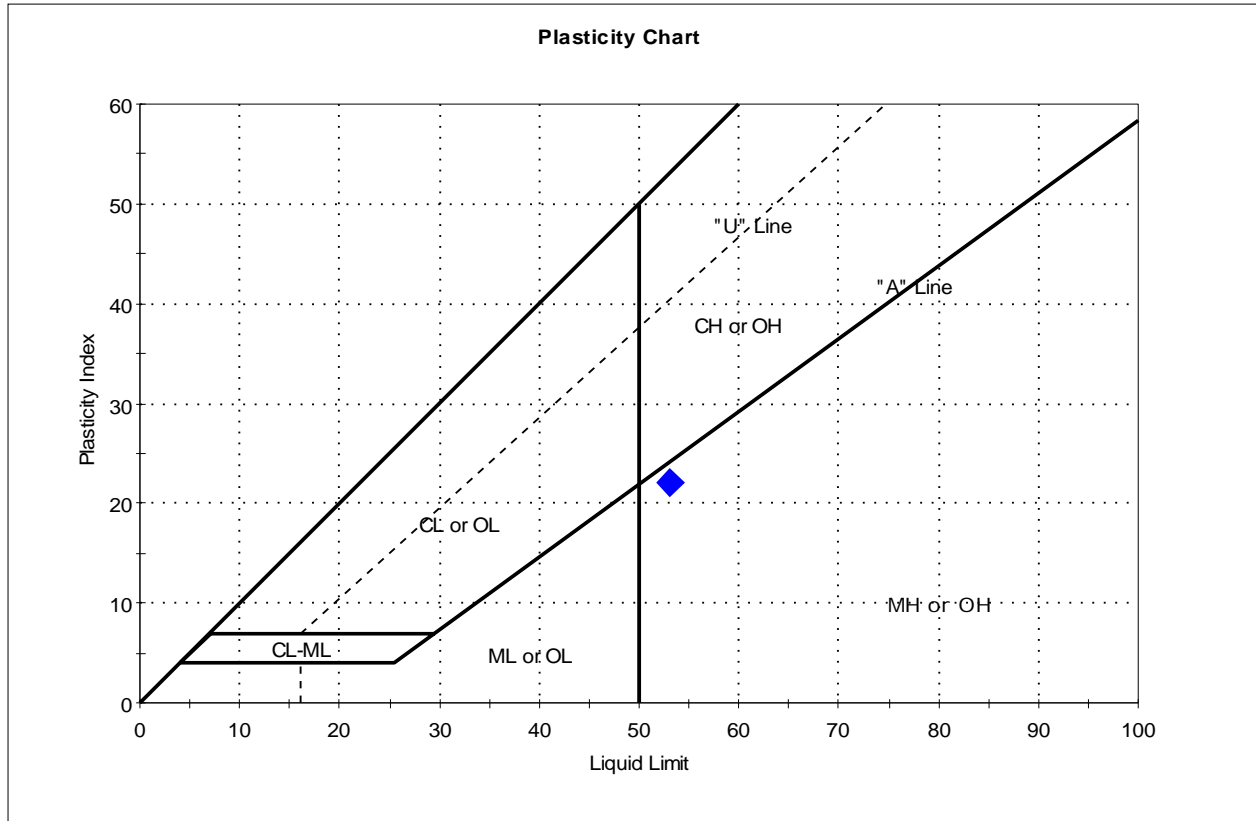
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-1	Sample Type:	tube
Sample ID:	ST-5	Test Date:	12/06/13
Depth :	14-16 ft	Test Id:	283977
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, dark grayish brown silt	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	ST-5	B-1	14-16 ft	55	53	32	21	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA	Project No:	GTX-301232
Boring ID:	B-1	Sample Type:	jar
Sample ID:	SPT-6	Test Date:	12/06/13
Depth :	19-21 ft	Test Id:	283978
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, very dark olive gray sandy silt		
Sample Comment:	---	Checked By:	jdt

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-6	B-1	19-21 ft	31	n/a	n/a	n/a	n/a	Sandy silt (ML)

0% Retained on #40 Sieve
 Dry Strength: MEDIUM
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA	Project No:	GTX-301232
Boring ID:	B-2	Sample Type:	jar
Sample ID:	SPT-5	Test Date:	12/24/13
Depth :	20-22 ft	Test Id:	285450
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, dark olive gray clayey sand		
Sample Comment:	---	Checked By:	jdt

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

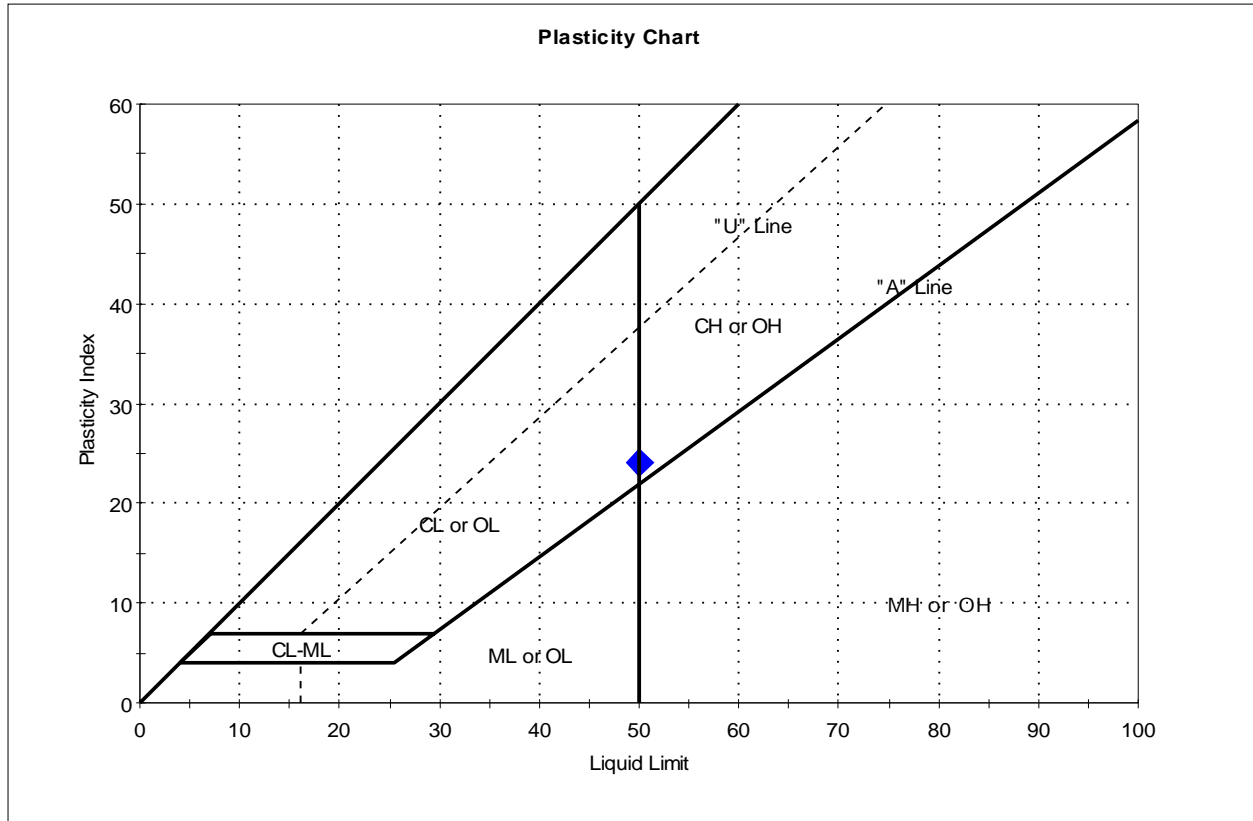
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-5	B-2	20-22 ft	37	n/a	n/a	n/a	n/a	

Dry Strength: HIGH
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Test Date:	12/24/13
Boring ID:	B-3	Test Id:	285449
Sample ID:	SPT-4	Checked By:	jdt
Depth :	15-17 ft		
Test Comment:	---		
Sample Description:	Moist, dark olive gray clay		
Sample Comment:	Sample contains shell fragments		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-4	B-3	15-17 ft	45	50	26	24	1	

Sample Prepared using the WET method

Dry Strength: HIGH

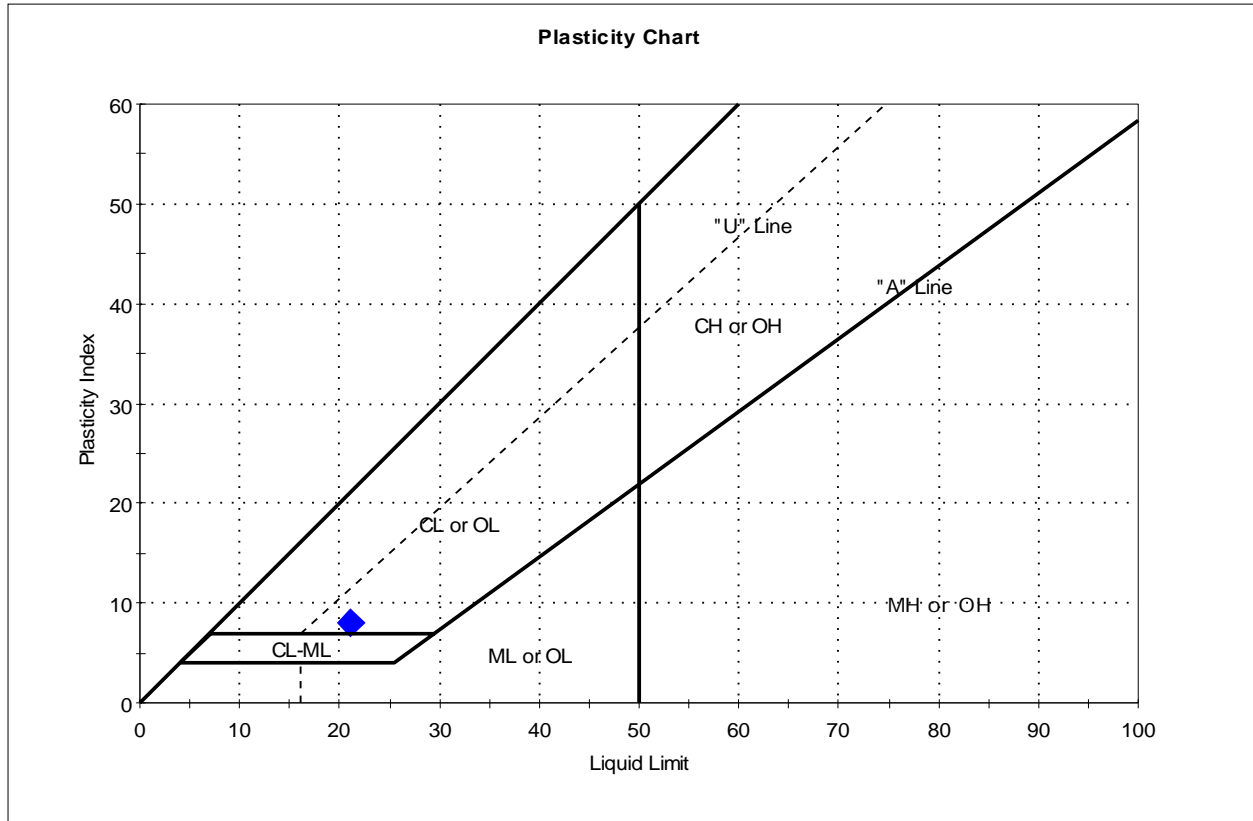
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-5	Sample Type:	jar
Sample ID:	SPT-6	Test Date:	12/06/13
Depth :	12-14 ft	Test Id:	283979
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, olive gray clayey sand	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-6	B-5	12-14 ft	10	21	13	8	0	Clayey sand (SC)

Sample Prepared using the WET method

33% Retained on #40 Sieve

Dry Strength: VERY HIGH

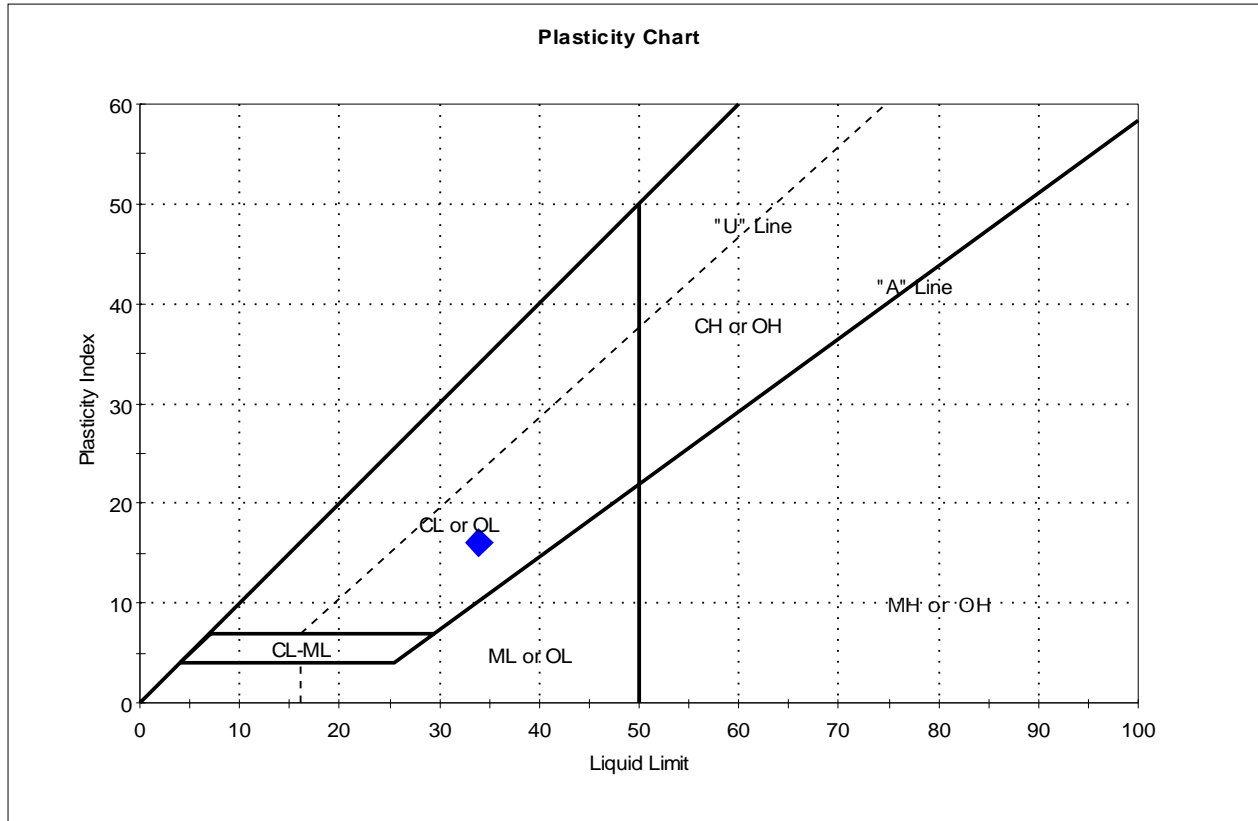
Dilatancy: SLOW

Toughness: MEDIUM



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-17	Sample Type:	jar
Sample ID:	SPT-4	Test Date:	12/06/13
Depth :	9-11 ft	Test Id:	283980
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, olive gray clay with sand	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-4	B-17	9-11 ft	17	34	18	16	0	lean clay with sand (CL)

Sample Prepared using the WET method

18% Retained on #40 Sieve

Dry Strength: VERY HIGH

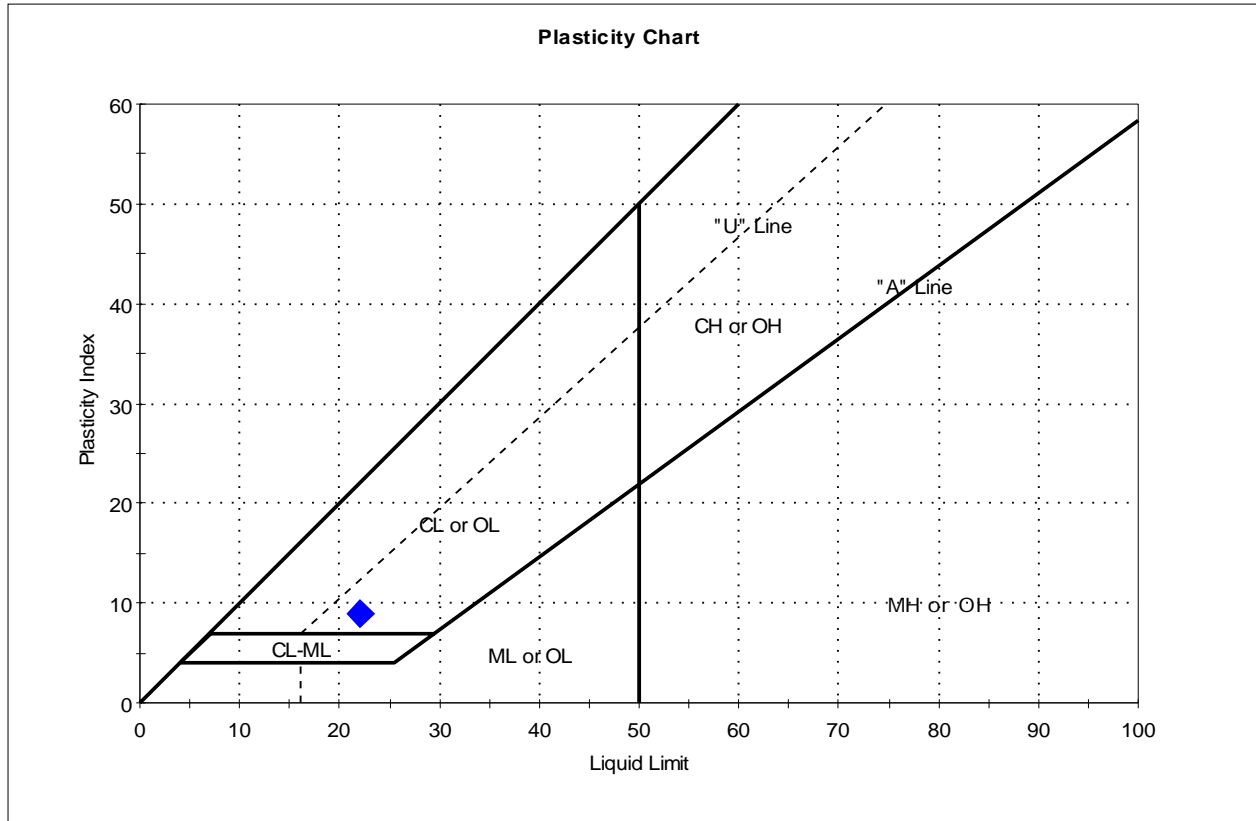
Dilatancy: SLOW

Toughness: MEDIUM



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Tested By:	cam
Boring ID:	B-18	Test Date:	01/15/14
Sample ID:	SPT-5	Checked By:	jdt
Depth :	19-21 ft	Test Id:	286937
Test Comment:	---		
Sample Description:	Moist, greenish gray clayey sand with gravel		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-5	B-18	19-21 ft	10	22	12	10	0	Clayey sand with gravel (SC)

Sample Prepared using the WET method

35% Retained on #40 Sieve

Dry Strength: VERY HIGH

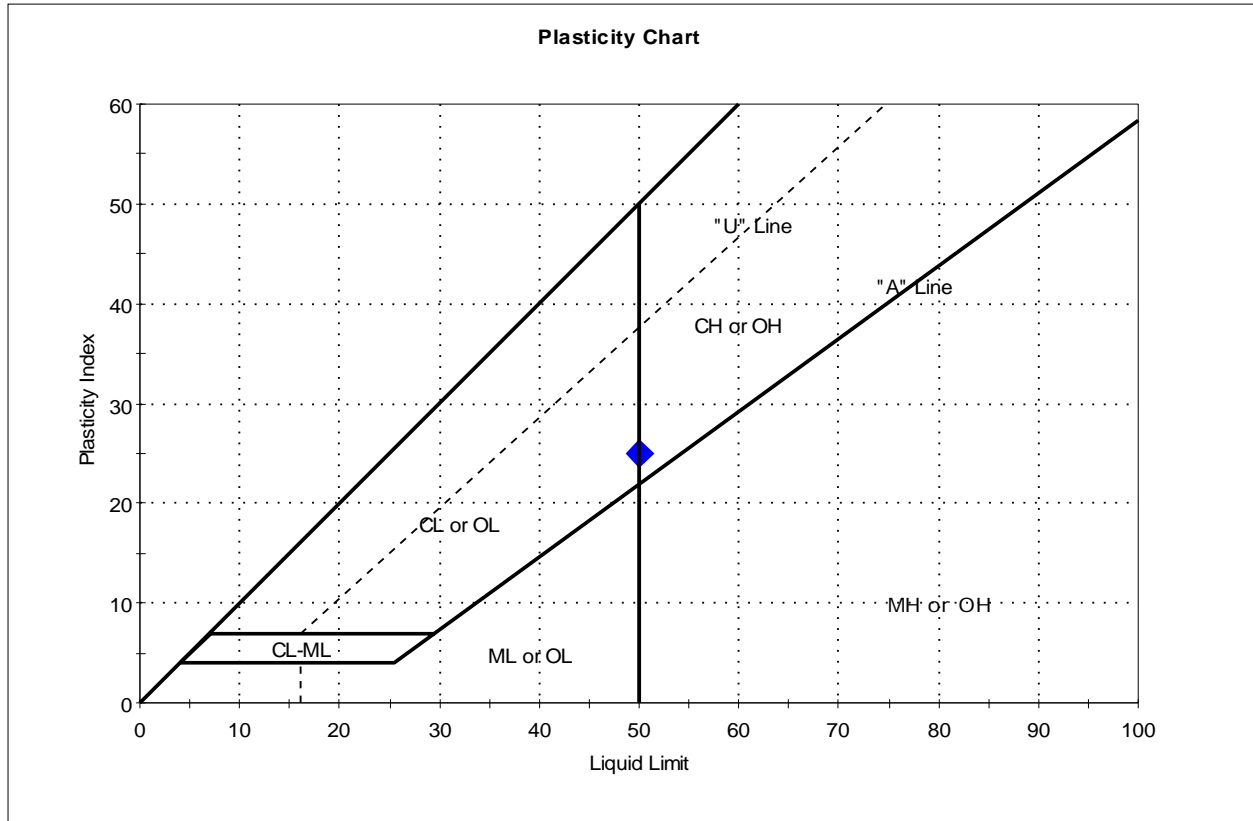
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Tested By:	cam
Boring ID:	B-22	Test Date:	12/20/13
Sample ID:	SPT-5	Checked By:	jdt
Depth :	14-16 ft	Test Id:	285451
Test Comment:	---		
Sample Description:	Moist, olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-5	B-22	14-16 ft	27	50	25	25	0	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

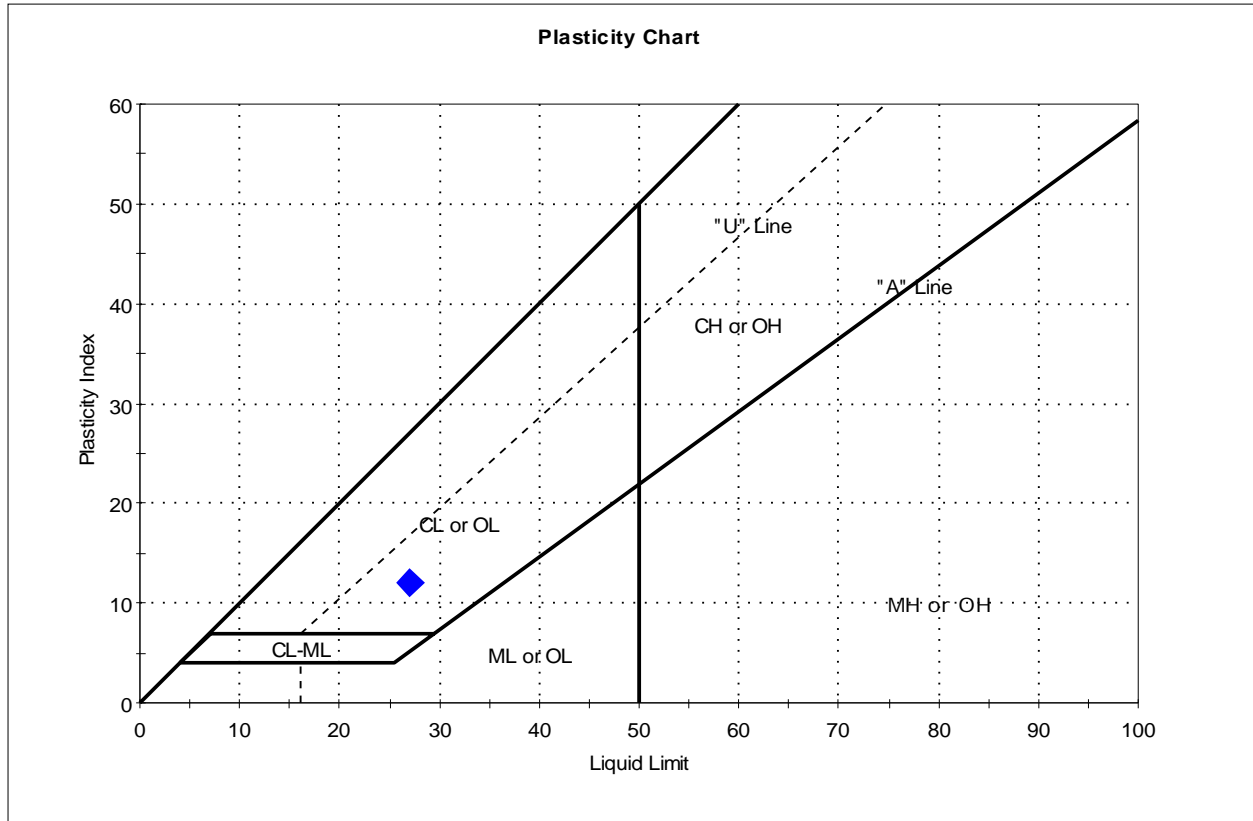
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-36	Sample Type:	jar
Sample ID:	SPT-3	Test Date:	01/28/14
Depth :	9-11 ft	Test Id:	287496
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, very dark gray clay	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-3	B-36	9-11 ft	20	27	15	12	0	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

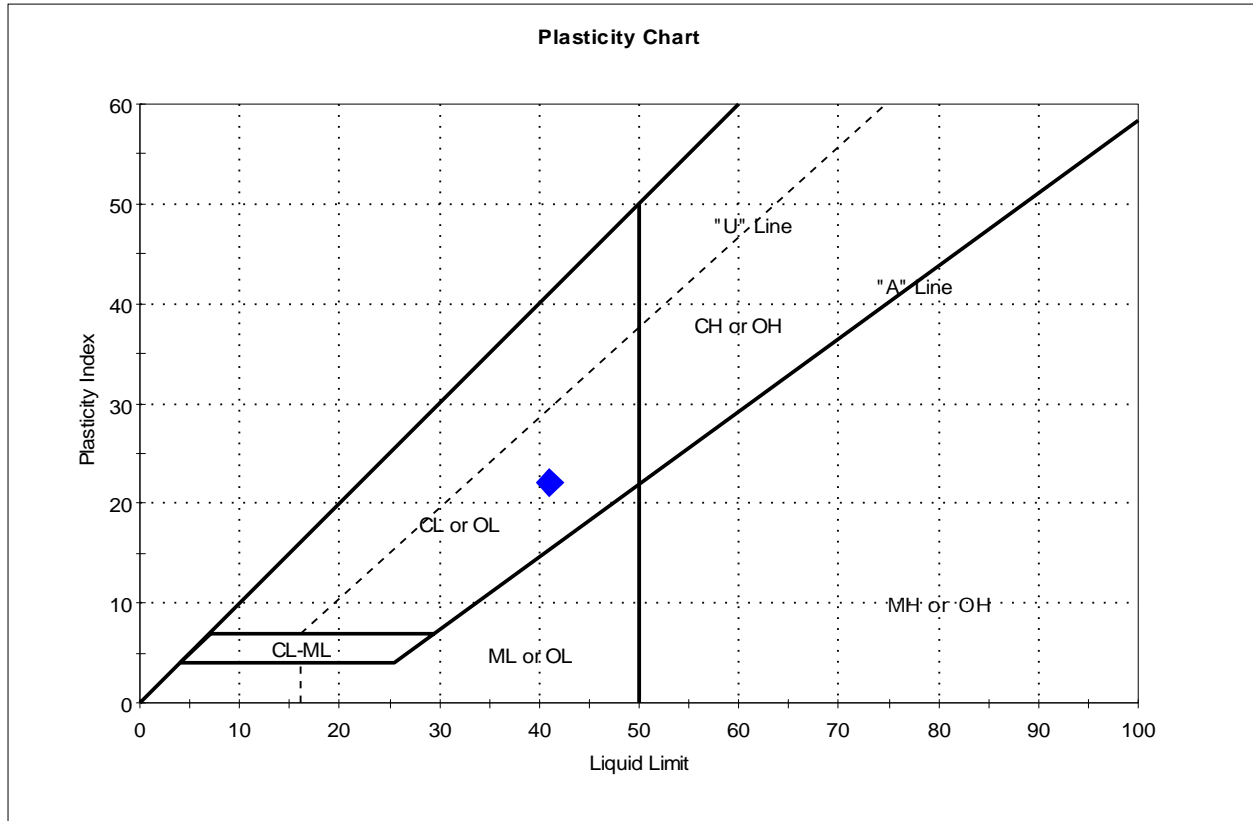
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Tested By:	cam
Boring ID:	B-36	Test Date:	01/27/14
Sample ID:	SPT-9	Checked By:	jdt
Depth :	39-41 ft	Test Id:	287497
Test Comment:	---		
Sample Description:	Moist, light brownish gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-9	B-36	39-41 ft	31	41	19	22	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

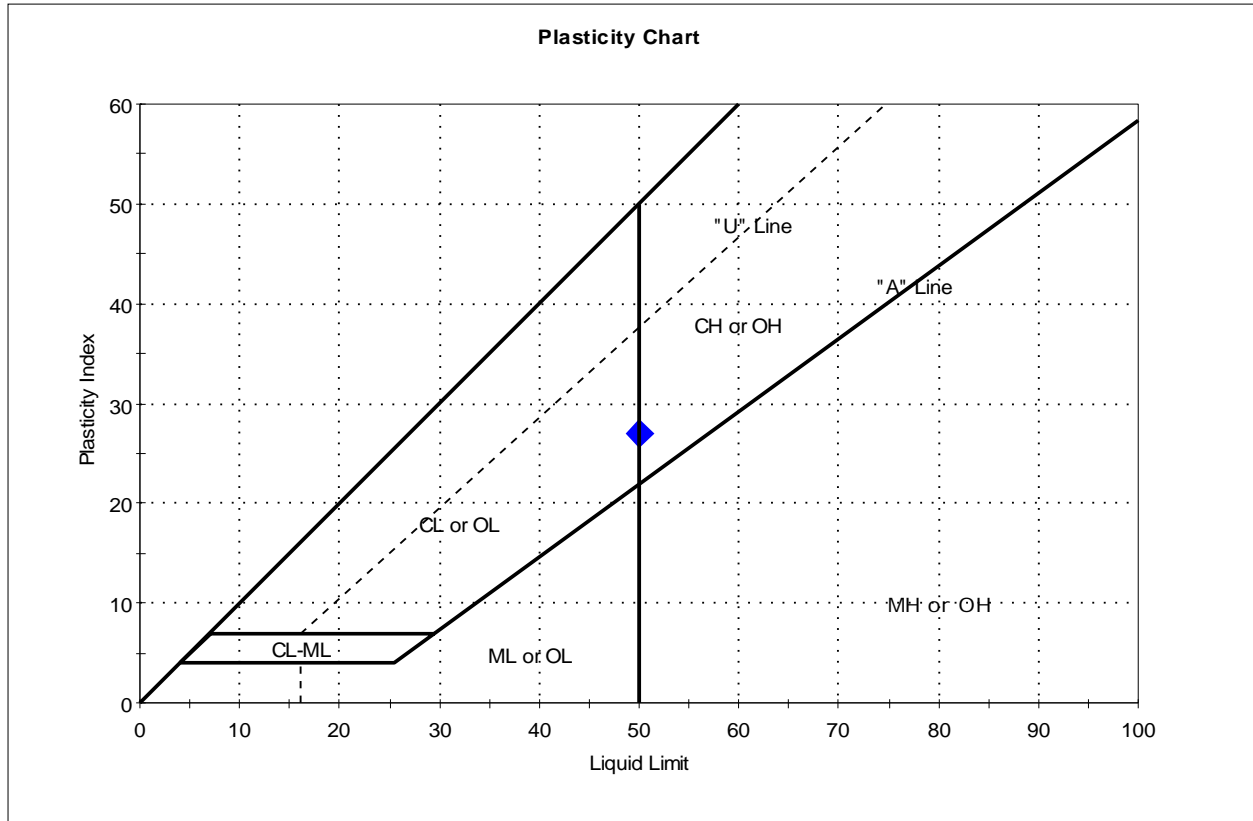
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Test Date:	12/20/13
Boring ID:	B-42	Checked By:	jdt
Sample ID:	SPT-9	Test Id:	285452
Depth :	39-41 ft		
Test Comment:	---		
Sample Description:	Moist, dark olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-9	B-42	39-41 ft	38	50	23	27	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

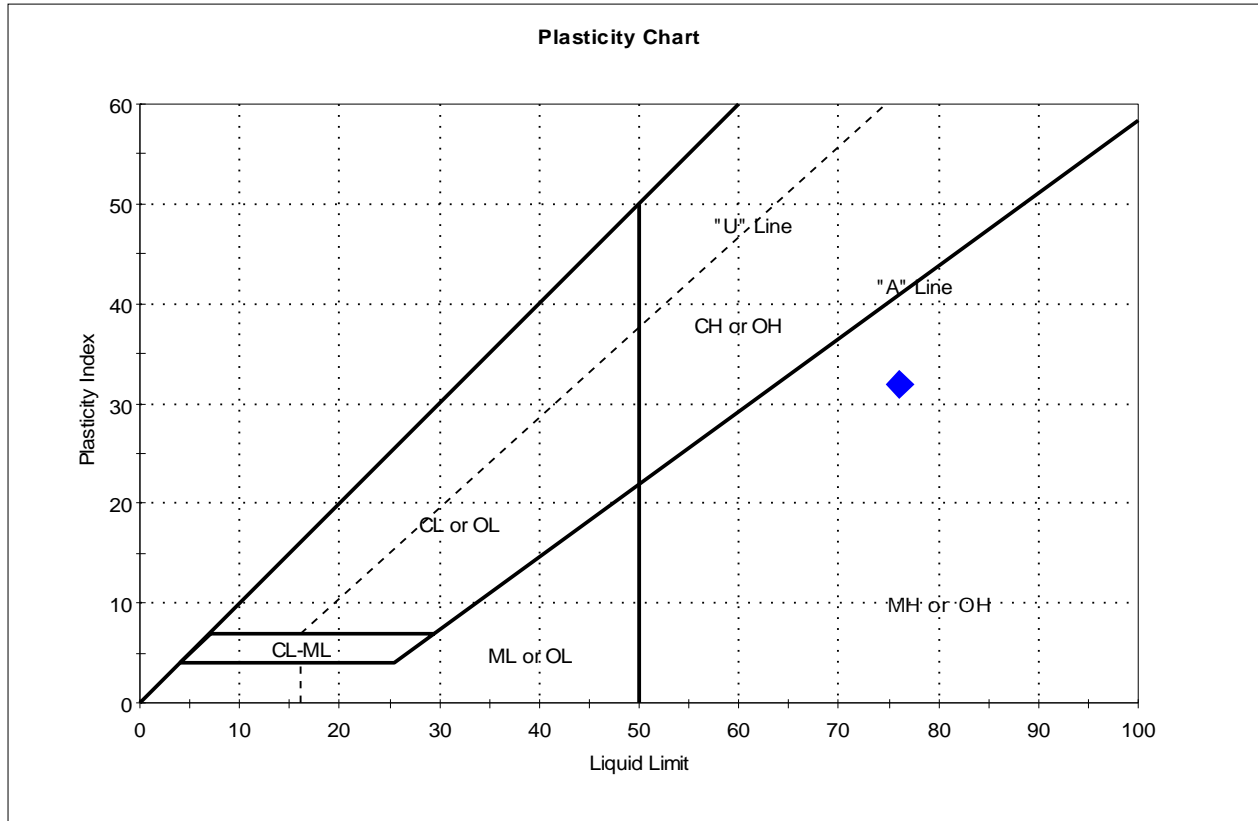
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-44	Sample Type:	jar
Sample ID:	SPT-1	Test Date:	01/28/14
Depth :	6-8 ft	Test Id:	287519
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, yellowish brown silty, clayey sand with gravel	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-1	B-44	6-8 ft	44	76	44	32	0	Silty, clayey sand with gravel (SC-SM)

Sample Prepared using the WET method

66% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

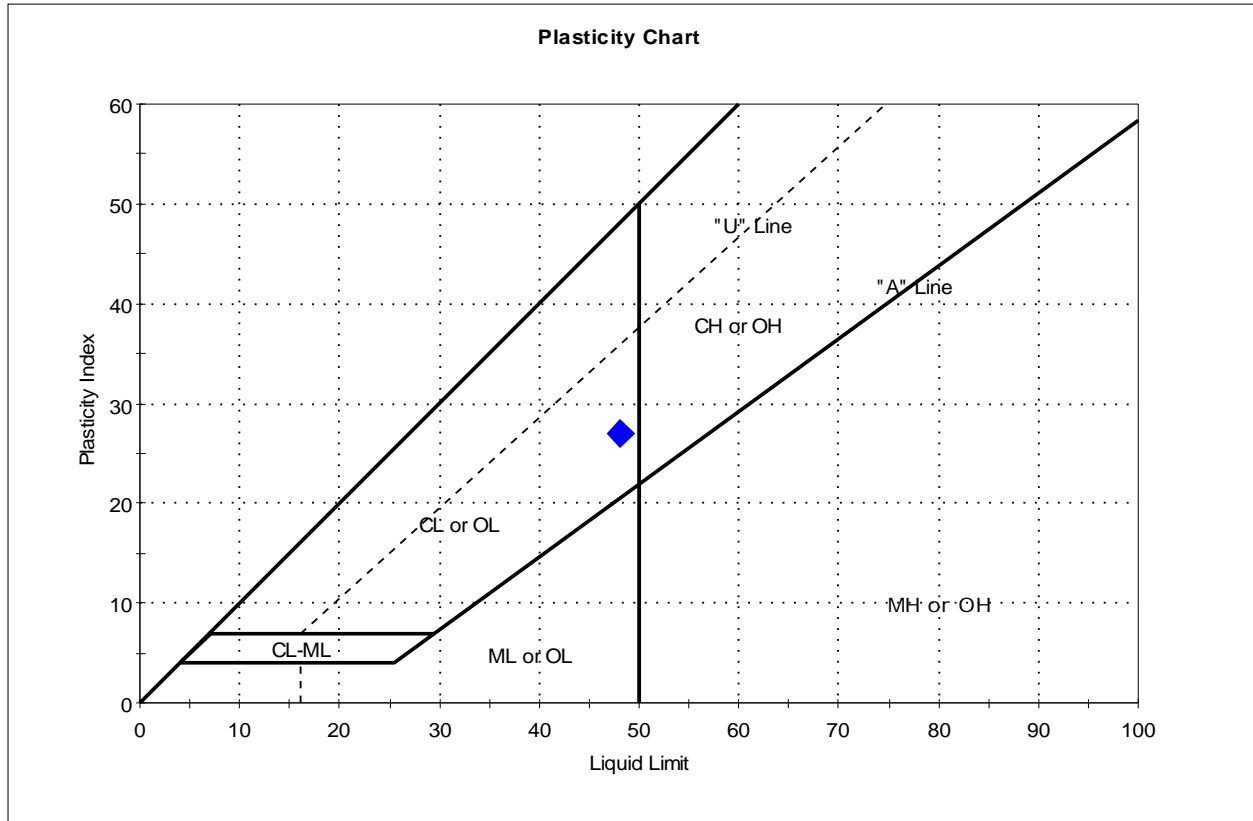
Toughness: LOW

Due to a high organic content an Oven Dried Liquid Limit was performed.
The Oven Dried Liquid Limit was determined to be non-plastic.



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	tube
Location:	Chelsea, MA	Tested By:	cam
Boring ID:	B-47	Test Date:	01/09/14
Sample ID:	OT-1	Checked By:	jdt
Depth :	24-26 ft	Test Id:	286851
Test Comment:	---		
Sample Description:	Moist, olive clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	OT-1	B-47	24-26 ft	34	48	21	27	0	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

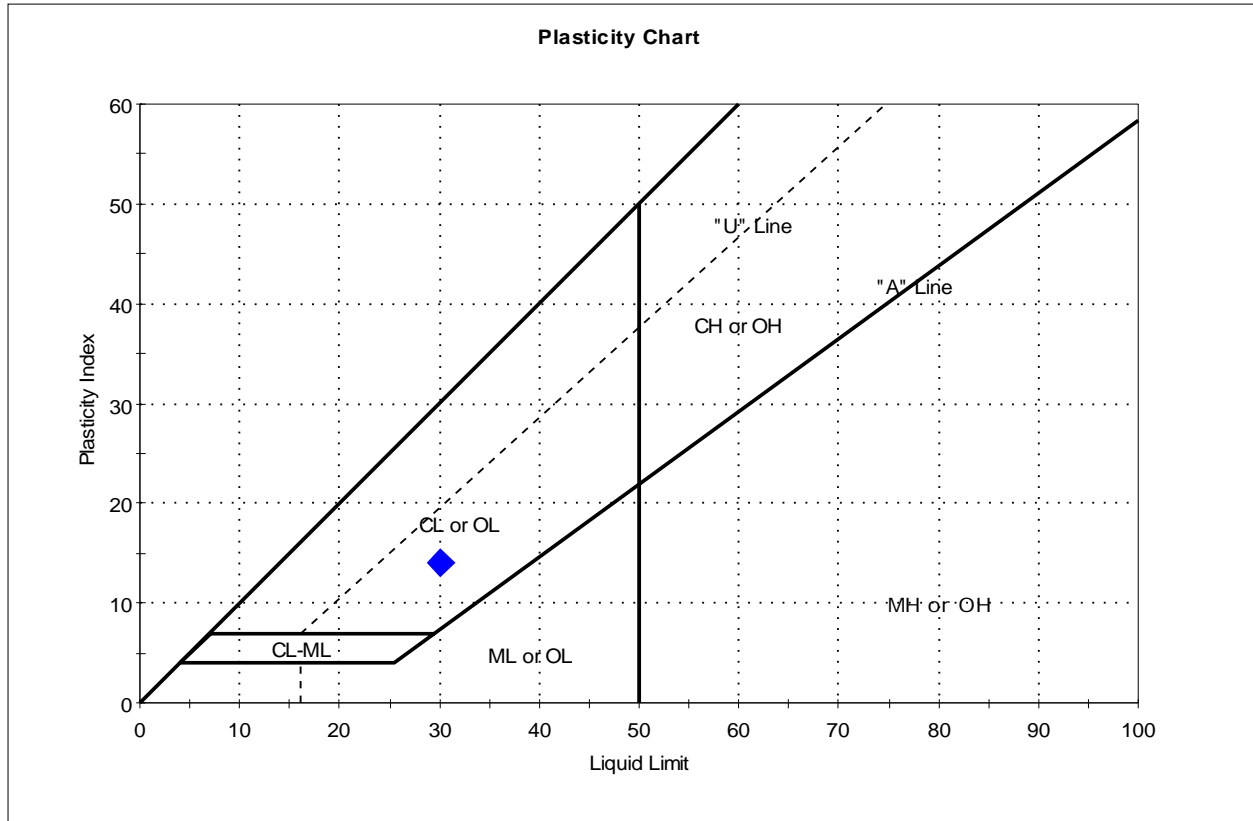
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-47	Sample Type:	tube
Sample ID:	OT-7	Test Date:	01/09/14
Depth :	59-61 ft	Test Id:	286852
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, olive gray clay	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	OT-7	B-47	59-61 ft	31	30	16	14	1	

Sample Prepared using the WET method

Dry Strength: HIGH

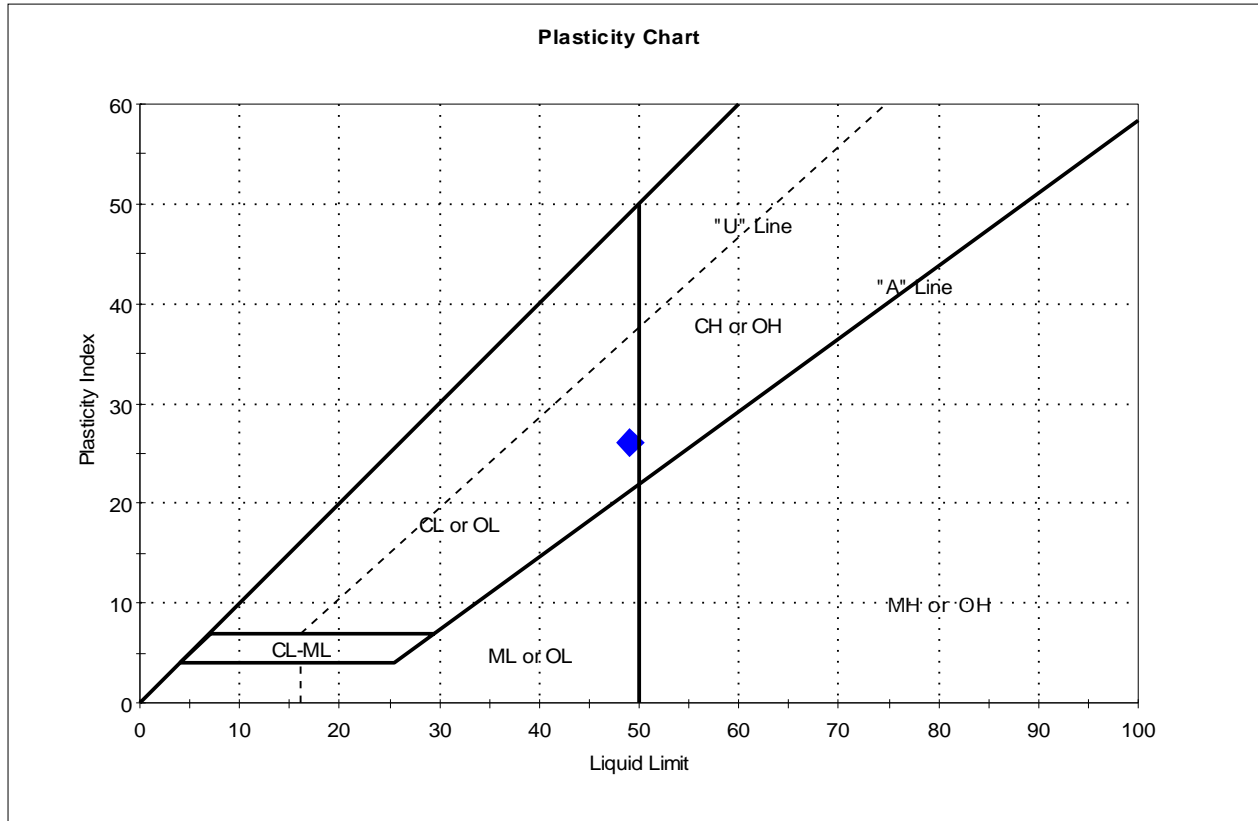
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Tested By:	cam
Boring ID:	B-50	Test Date:	01/27/14
Sample ID:	SPT-2	Checked By:	jdt
Depth :	14-16 ft	Test Id:	287499
Test Comment:	---		
Sample Description:	Moist, light brownish gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-2	B-50	14-16 ft	34	49	23	26	0	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

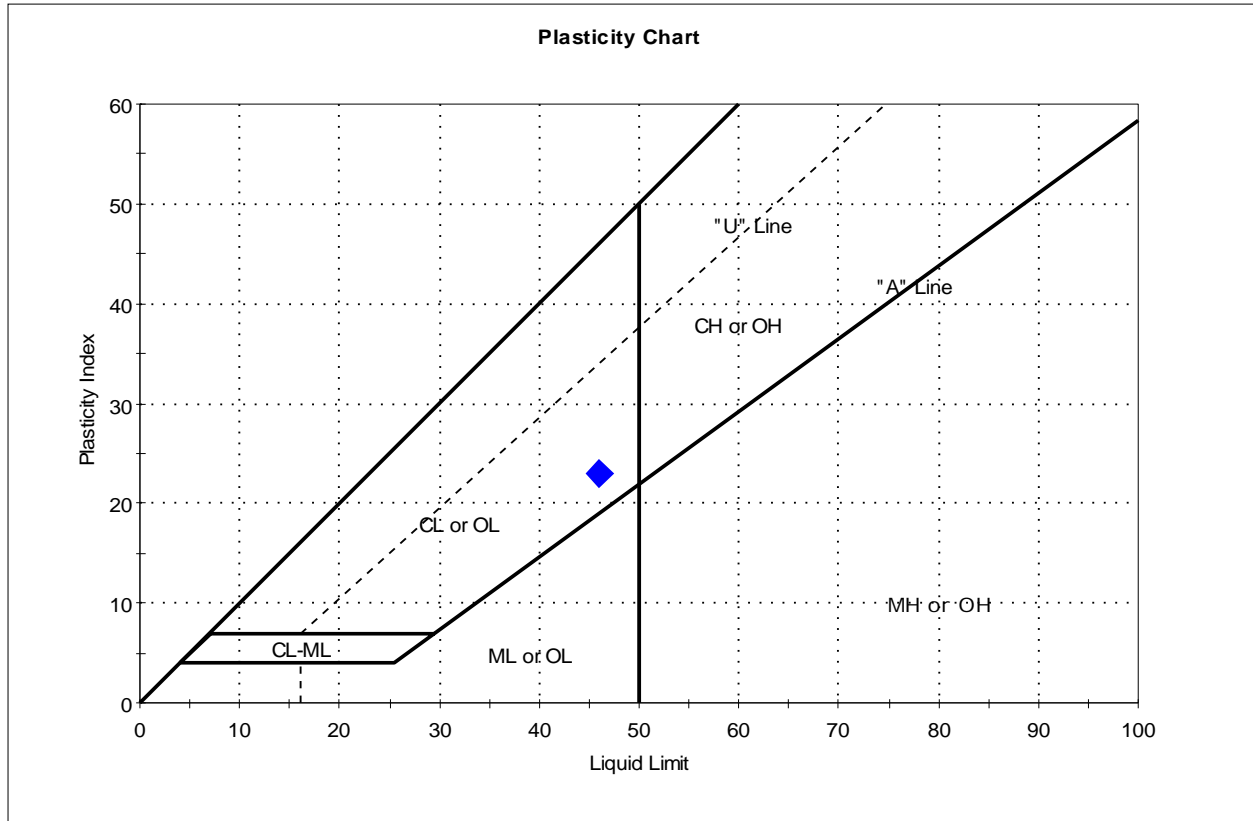
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-50	Sample Type:	jar
Sample ID:	SPT-6	Test Date:	01/27/14
Depth :	39-41 ft	Test Id:	287498
Test Comment:	---	Tested By:	cam
Sample Description:	Moist, light brownish gray clay	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-6	B-50	39-41 ft	39	46	23	23	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

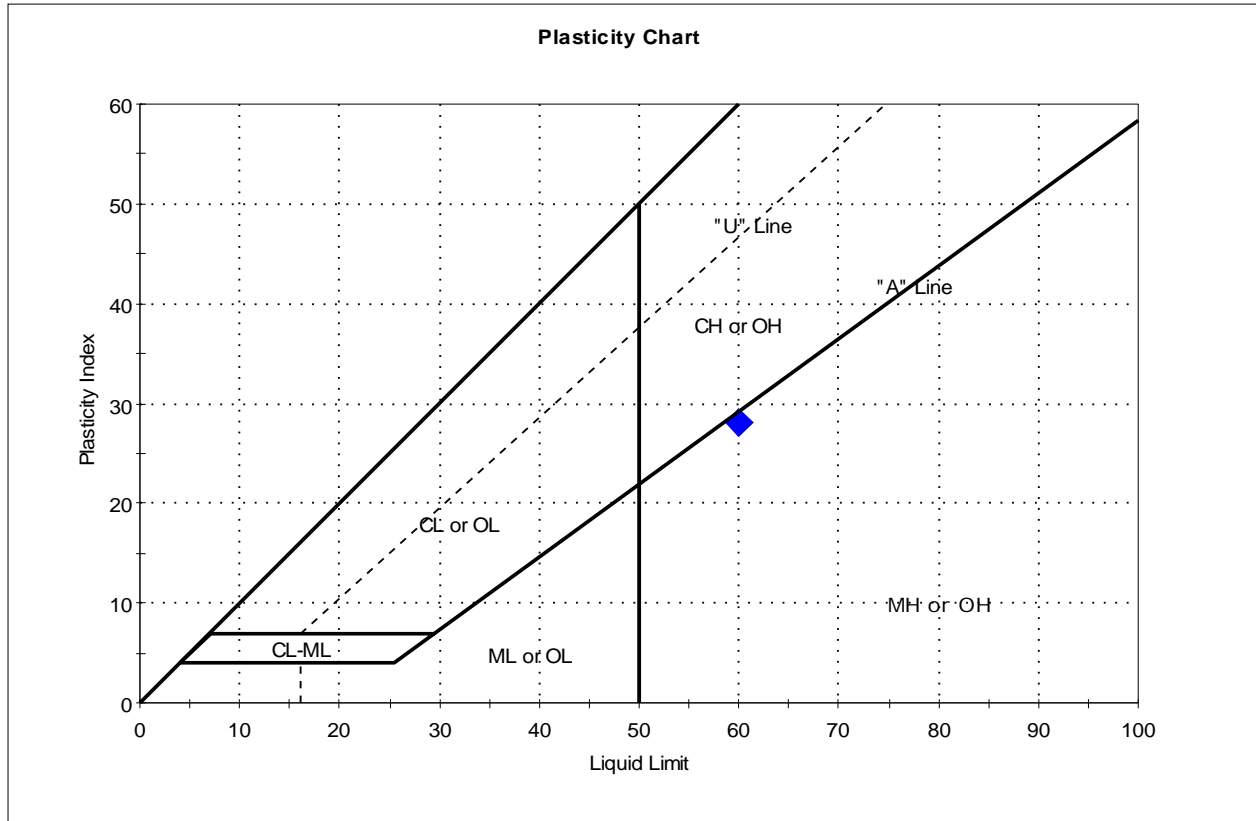
Dilatancy: SLOW

Toughness: LOW



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-52	Sample Type:	jar
Sample ID:	SPT-1	Test Date:	01/30/14
Depth :	6-8 ft	Test Id:	287518
Test Comment:	---	Tested By:	cam
Sample Description:	Wet, very dark brown sandy silt	Checked By:	jdt
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-1	B-52	6-8 ft	65	60	32	28	1	Sandy elastic silt (MH)

Sample Prepared using the WET method

31% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

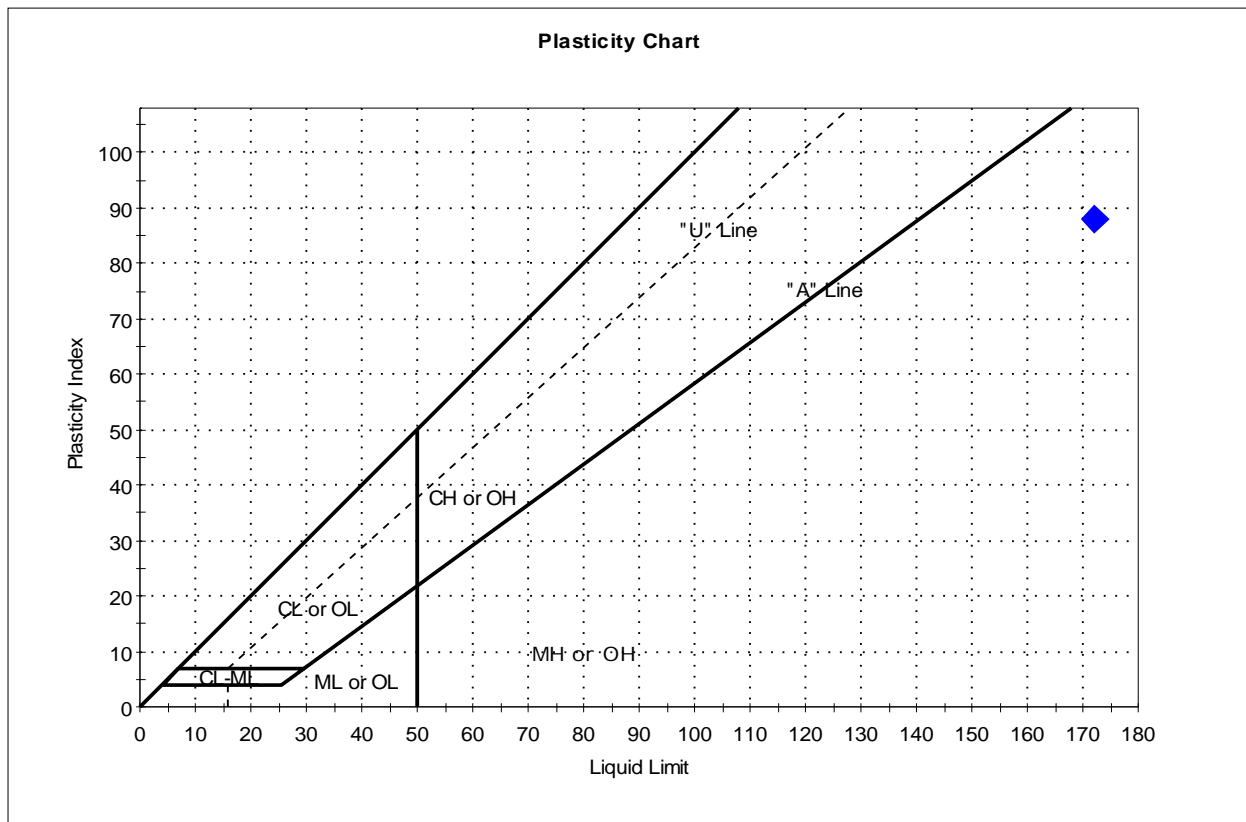
Toughness: LOW

Due to a high organic content an Oven Dried Liquid Limit was performed.
The Oven Dried Liquid Limit was 47



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline	Sample Type:	jar
Location:	Chelsea, MA	Tested By:	cam
Boring ID:	B-59	Test Date:	01/30/14
Sample ID:	SPT-2	Checked By:	jdt
Depth :	10-12 ft	Test Id:	287520
Test Comment:	---		
Sample Description:	Moist, very dark brown sandy silt		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SPT-2	B-59	10-12 ft	167	172	85	87	1	Sandy organic silt (OH)

Sample Prepared using the WET method

17% Retained on #40 Sieve

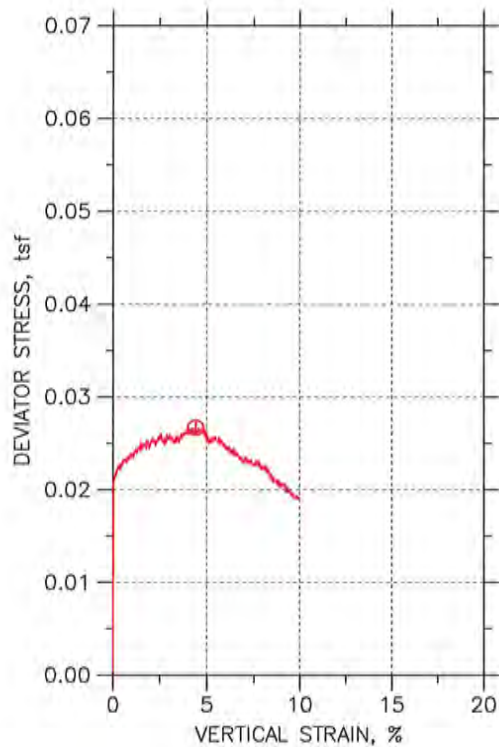
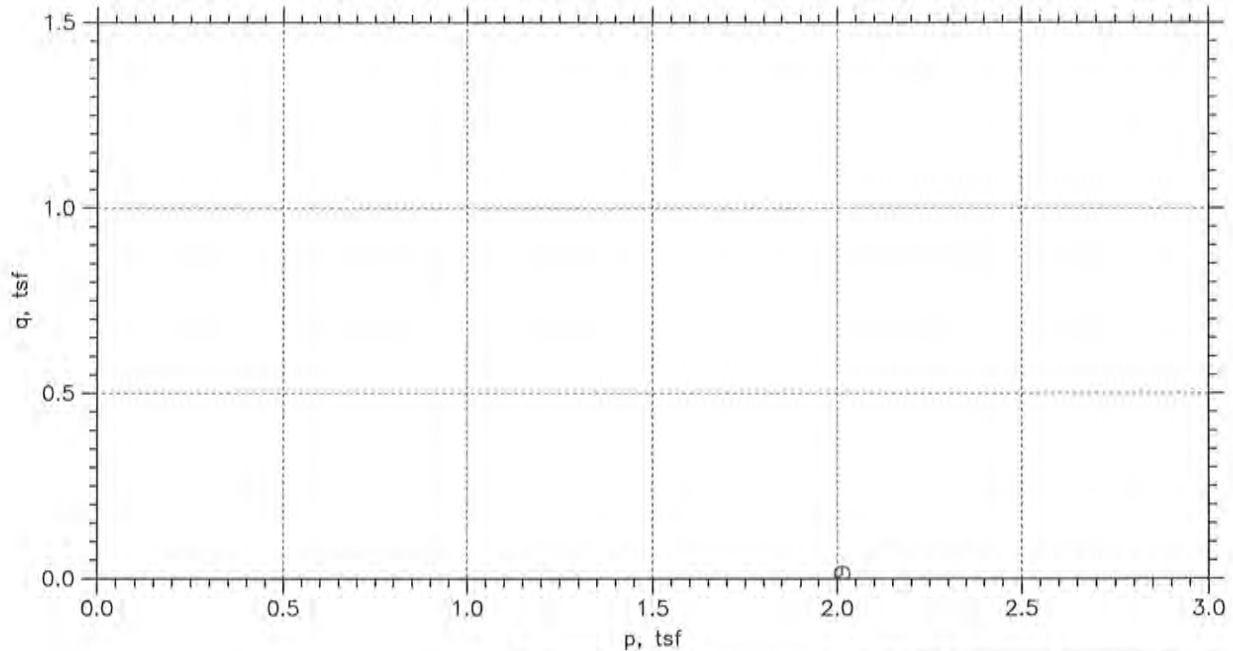
Dry Strength: VERY HIGH

Dilatancy: SLOW



Toughness: LOW

Due to a high organic content an Oven Dried Liquid Limit was performed.
The Oven Dried Liquid Limit was 85

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850

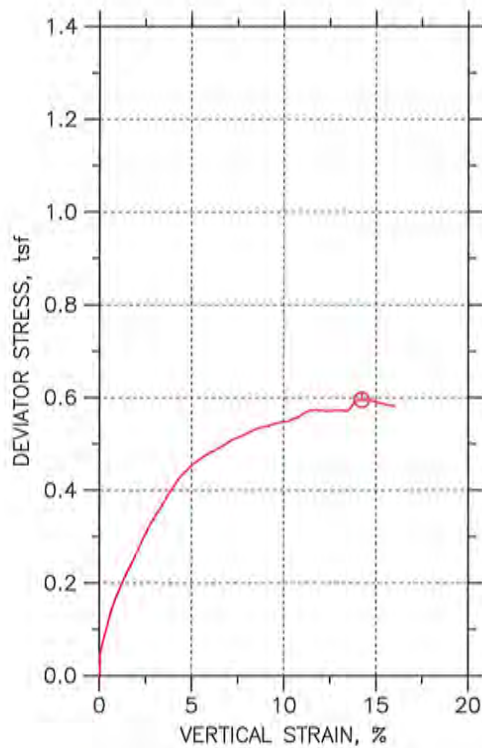
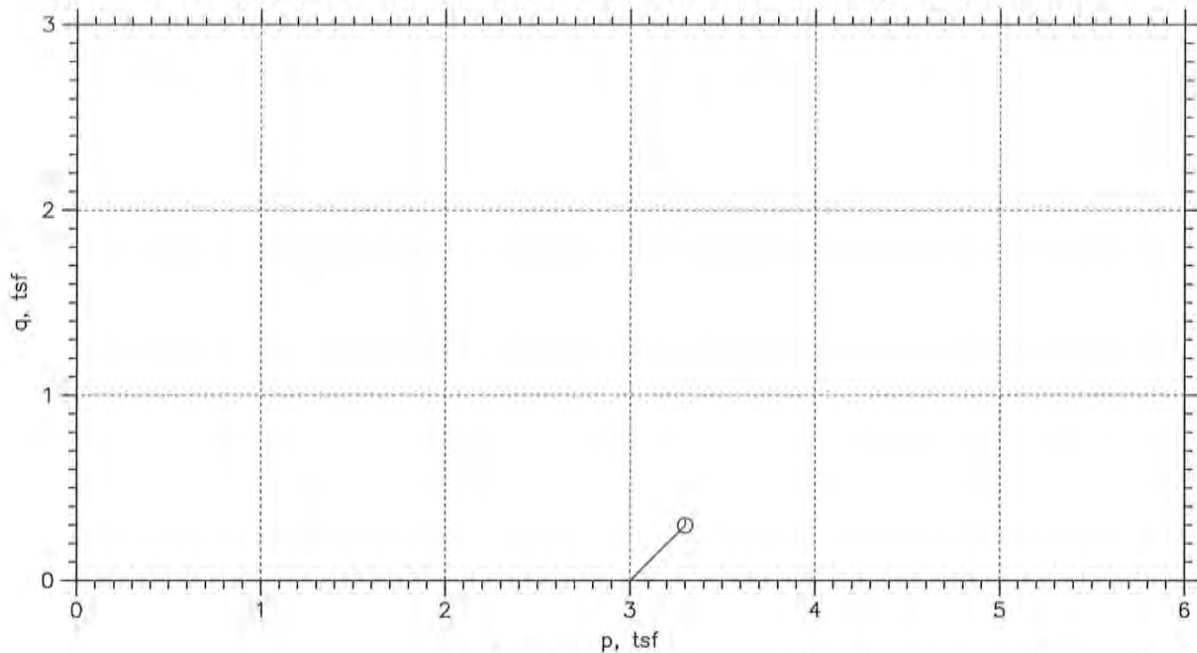


Symbol	Ø			
Sample No.	ST-5			
Test No.	UU-1			
Depth	14-16 ft			
Tested by	md			
Test Date	12/03/13			
Checked by	jdt			
Check Date	12/06/13			
Diameter, in	2.89			
Height, in	5.95			
Water Content, %	90.8			
Dry Density, pcf	47.83			
Saturation, %	96.4			
Void Ratio	2.59			
Confining Stress, tsf	2			
Undrained Strength, tsf	0.01335			
Max. Dev. Stress, tsf	0.02669			
Strain at Failure, %	4.4			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.75			
Liquid Limit	53			
Plastic Limit	32			
Plasticity Index	21			



	Project: Silverline				
	Location: Chelsea, MA				
	Project No.: GTX-301232				
	Boring No.: B-1				
	Sample Type: intact				
	Description: Wet, dark grayish brown silt				
	Remarks: System R				

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850

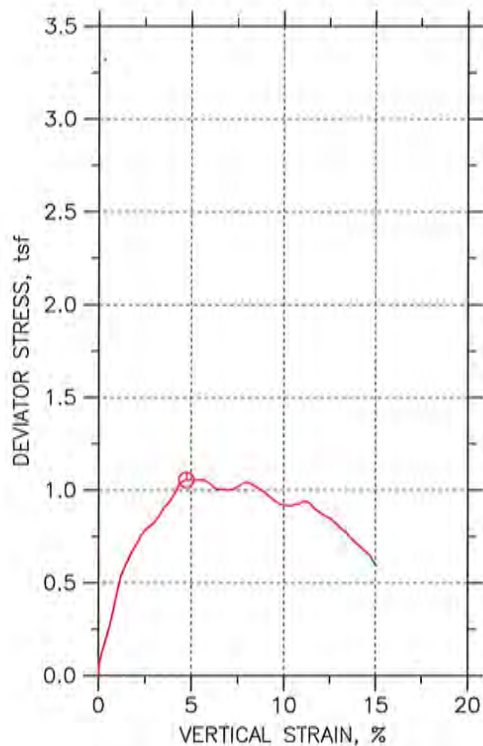
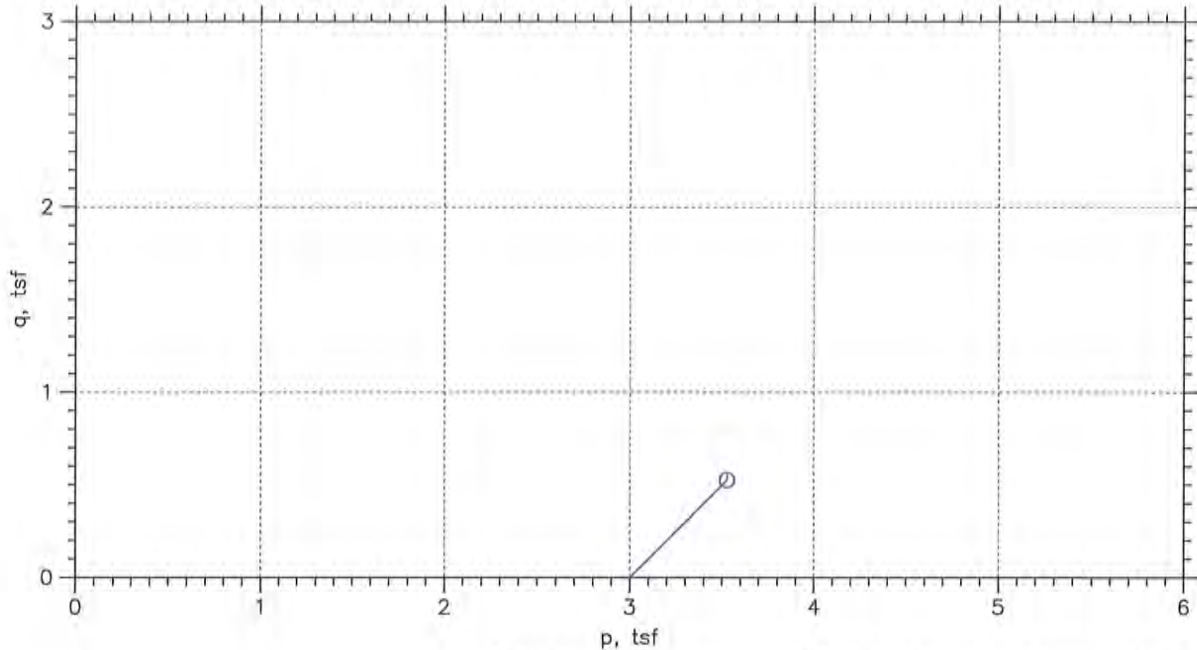


Symbol	⊖			
Sample No.	OT-3			
Test No.	UU-2			
Depth	34-36 ft			
Tested by	md			
Test Date	12/26/13			
Checked by	jdt			
Check Date	01/07/14			
Diameter, in	2.87			
Height, in	6.1			
Water Content, %	35.3			
Dry Density, pcf	85.95			
Saturation, %	95.7			
Void Ratio	1.03			
Confining Stress, tsf	3			
Undrained Strength, tsf	0.2975			
Max. Dev. Stress, tsf	0.5949			
Strain at Failure, %	14.2			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.8			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			


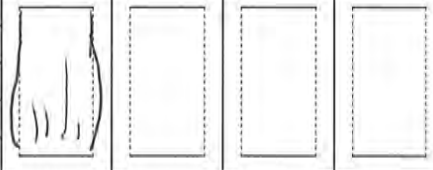
	Project: Silverline				
	Location: Chelsea, MA				
	Project No.: GTX-301232				
	Boring No.: B-47				
	Sample Type: intact				
	Description: Moist, greenish gray clay				
	Remarks: System W				

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850

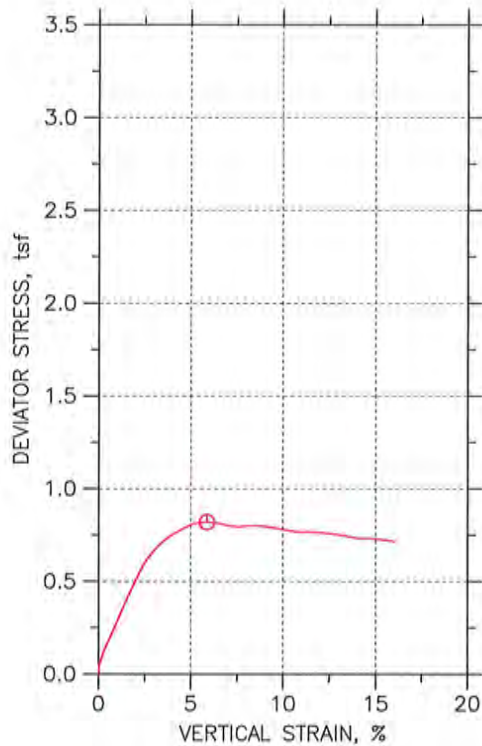
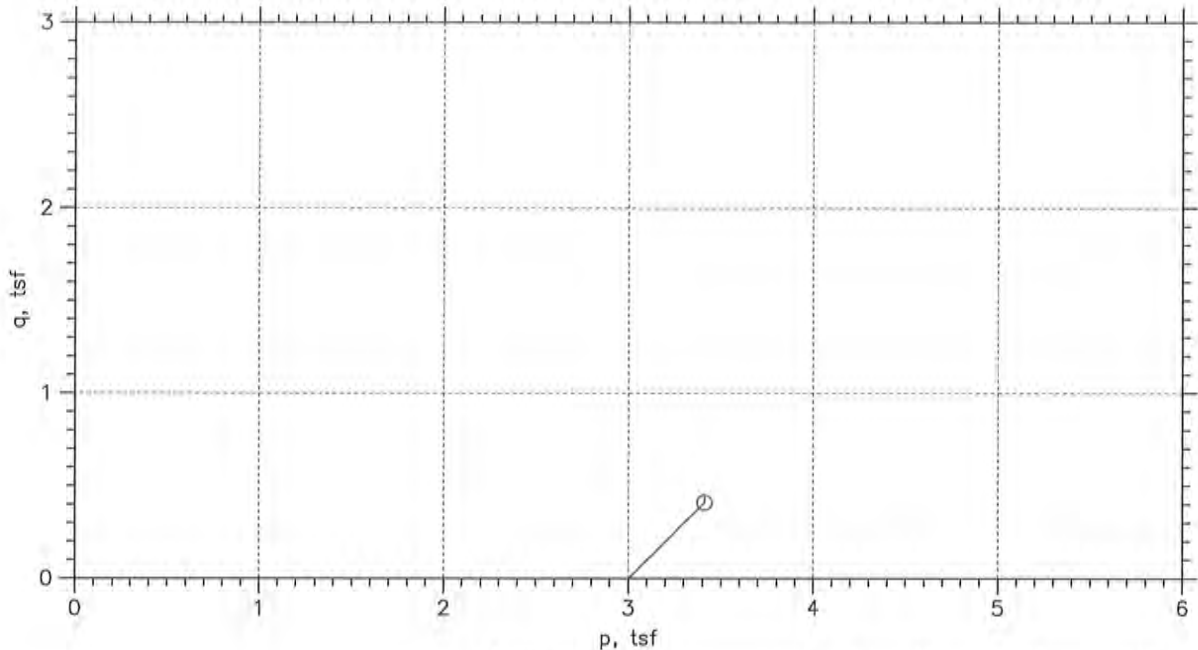


Symbol	⊖			
Sample No.	OT-7			
Test No.	UU-3			
Depth	59-61 ft			
Tested by	md			
Test Date	12/26/13			
Checked by	jdt			
Check Date	01/07/14			
Diameter, in	2.87			
Height, in	6.2			
Water Content, %	29.7			
Dry Density, pcf	93.52			
Saturation, %	95.7			
Void Ratio	0.869			
Confining Stress, tsf	3			
Undrained Strength, tsf	0.5273			
Max. Dev. Stress, tsf	1.055			
Strain at Failure, %	4.7			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.8			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			


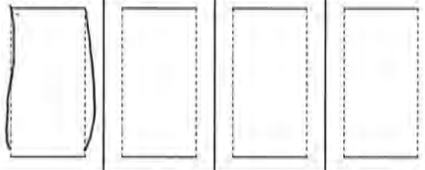
	Project: Silverline	
	Location: Chelsea, MA	
	Project No.: GTX-301232	
	Boring No.: B-47	
	Sample Type: intact	
	Description: Moist, greenish gray clay	
	Remarks: System W	

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850

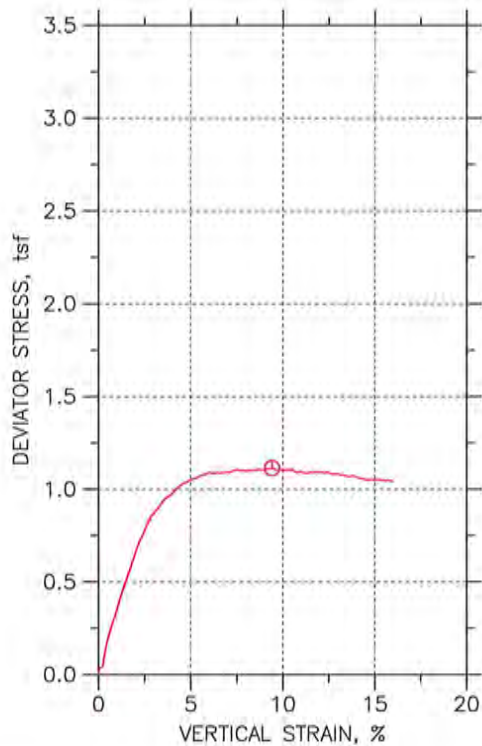
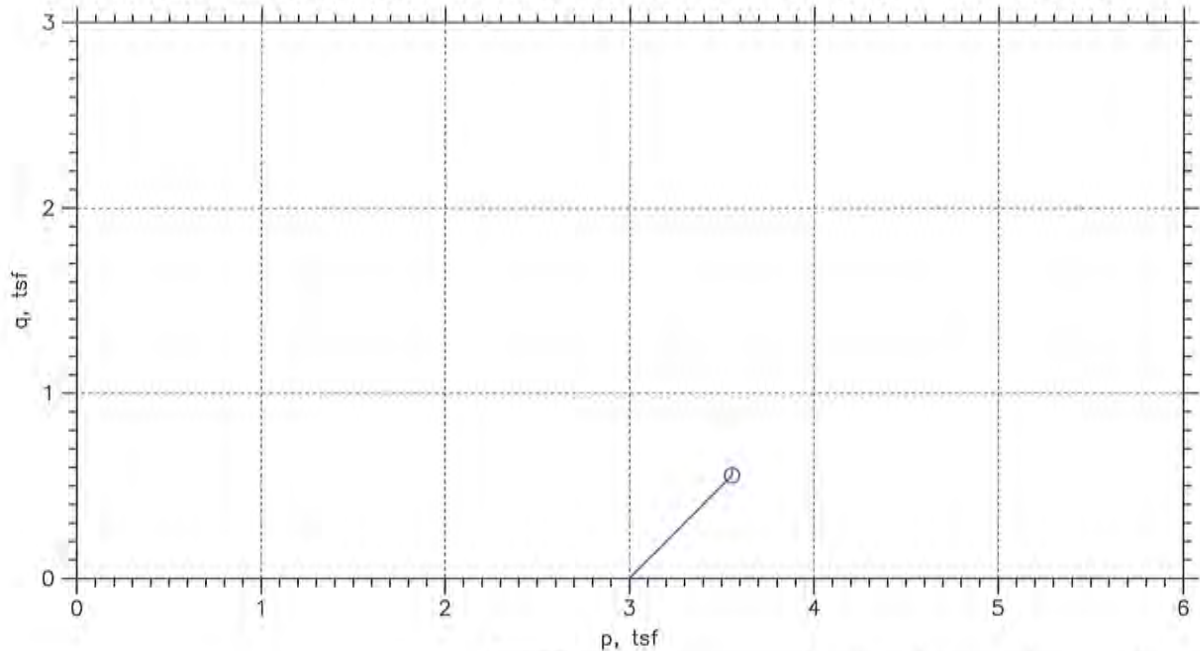


Symbol	⊕			
Sample No.	OT-9			
Test No.	UU-4			
Depth	79-81 ft			
Tested by	md			
Test Date	12/26/13			
Checked by	jdt			
Check Date	01/07/14			
Diameter, in	2.87			
Height, in	6.13			
Water Content, %	23.6			
Dry Density, pcf	99.29			
Saturation, %	87.1			
Void Ratio	0.76			
Confining Stress, tsf	3			
Undrained Strength, tsf	0.4096			
Max. Dev. Stress, tsf	0.8193			
Strain at Failure, %	5.85			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.8			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			



	Project: Silverline	
	Location: Chelsea, MA	
	Project No.: GTX-301232	
	Boring No.: B-47	
	Sample Type: intact	
	Description: Moist, greenish gray clay with sand	
	Remarks: System W	

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850

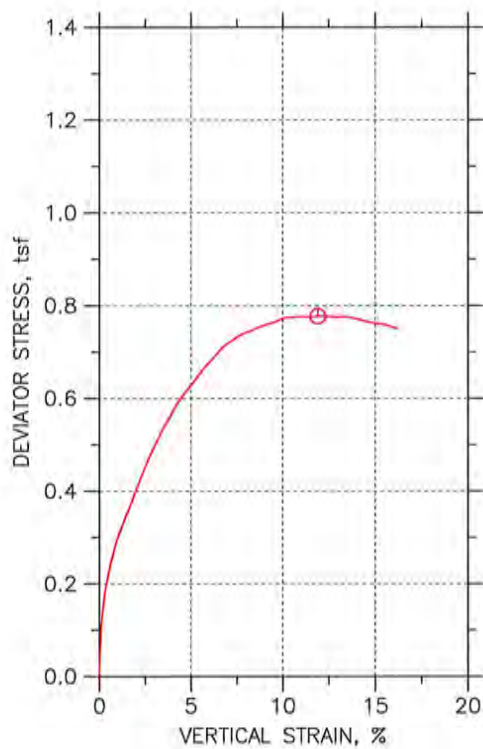
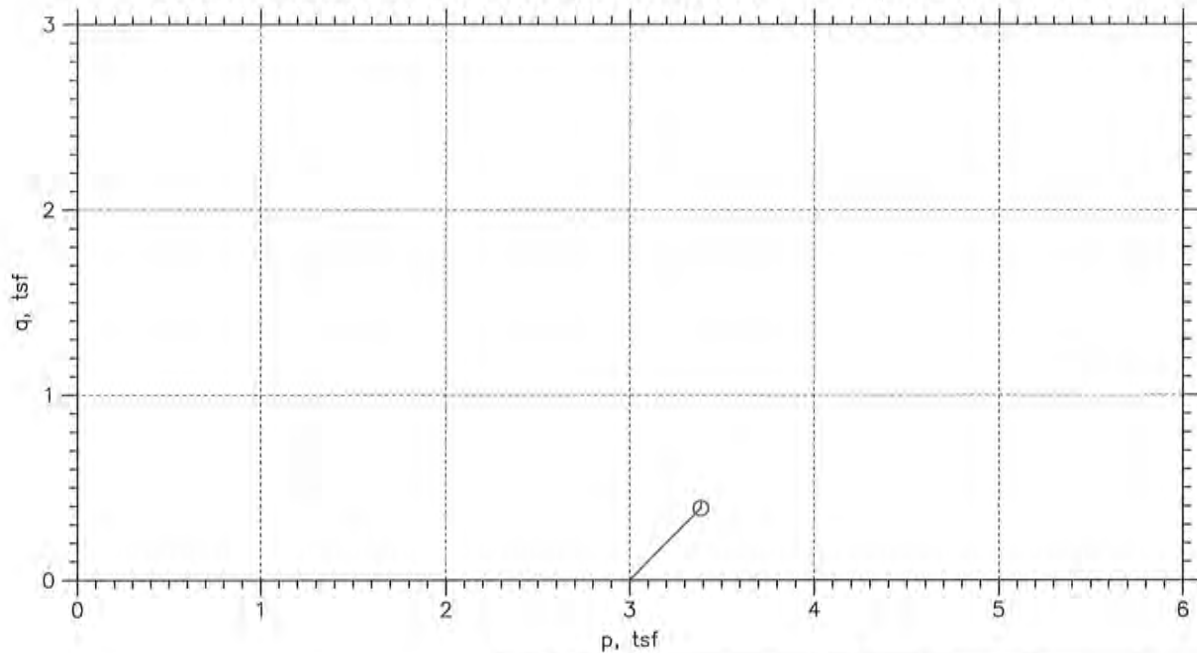


Symbol	①			
Sample No.	OT-1			
Test No.	UU-5			
Depth	19-21 ft			
Tested by	md			
Test Date	01/10/14			
Checked by	jdt			
Check Date				
Diameter, in	2.87			
Height, in	6.15			
Water Content, %	38.3			
Dry Density, pcf	83.31			
Saturation, %	99.2			
Void Ratio	1.06			
Confining Stress, tsf	3			
Undrained Strength, tsf	0.5566			
Max. Dev. Stress, tsf	1.113			
Strain at Failure, %	9.42			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.75			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			


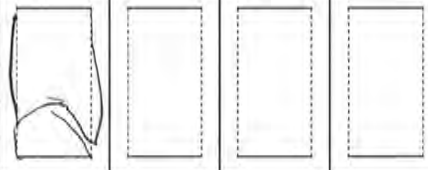
	Project: Silverline				
	Location: Chelsea, MA				
	Project No.: GTX-301232				
	Boring No.: B-50				
	Sample Type: intact				
	Description: Moist, greenish gray clay				
	Remarks: System W				

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850

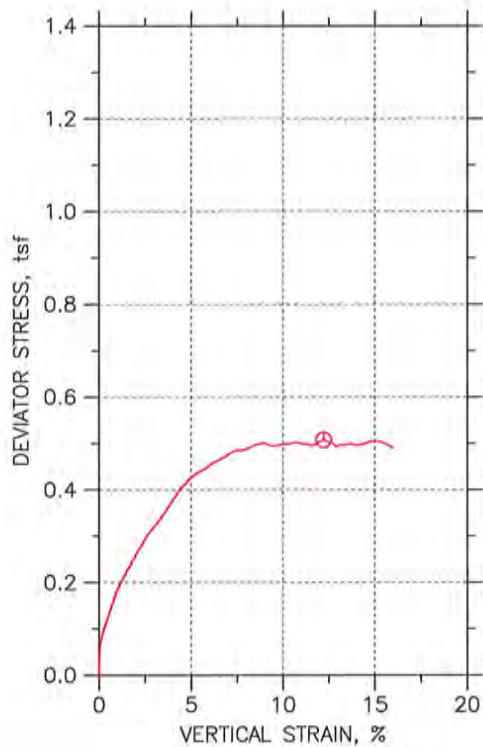
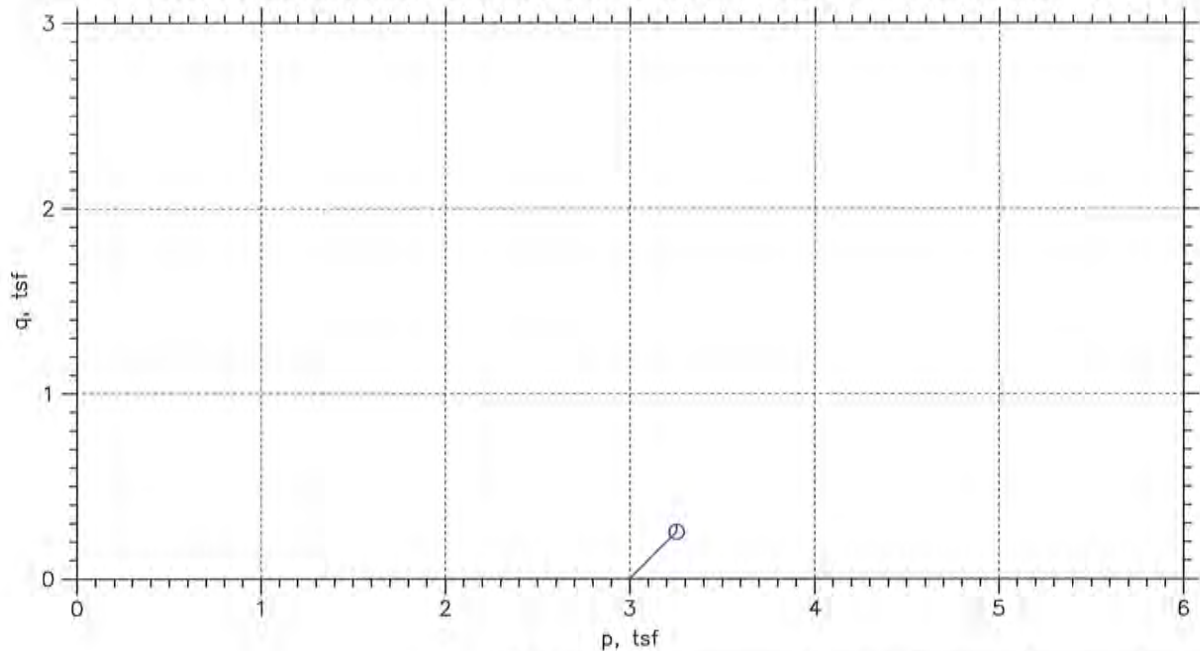


Symbol	⊙			
Sample No.	OT-1			
Test No.	UU-7			
Depth	29-31 ft			
Tested by	md			
Test Date	01/24/14			
Checked by	jdt			
Check Date	01/31/14			
Diameter, in	2.87			
Height, in	6.09			
Water Content, %	36.9			
Dry Density, pcf	83.84			
Saturation, %	96.9			
Void Ratio	1.05			
Confining Stress, tsf	3			
Undrained Strength, tsf	0.3885			
Max. Dev. Stress, tsf	0.777			
Strain at Failure, %	11.9			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.75			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			


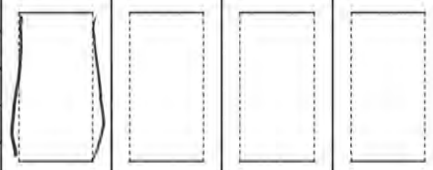
	Project: Silverline	
	Location: Chelsea, MA	
	Project No.: GTX-301232	
	Boring No.: B-51	
	Sample Type: intact	
	Description: Moist, greenish gray clay	
	Remarks: System W	

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850



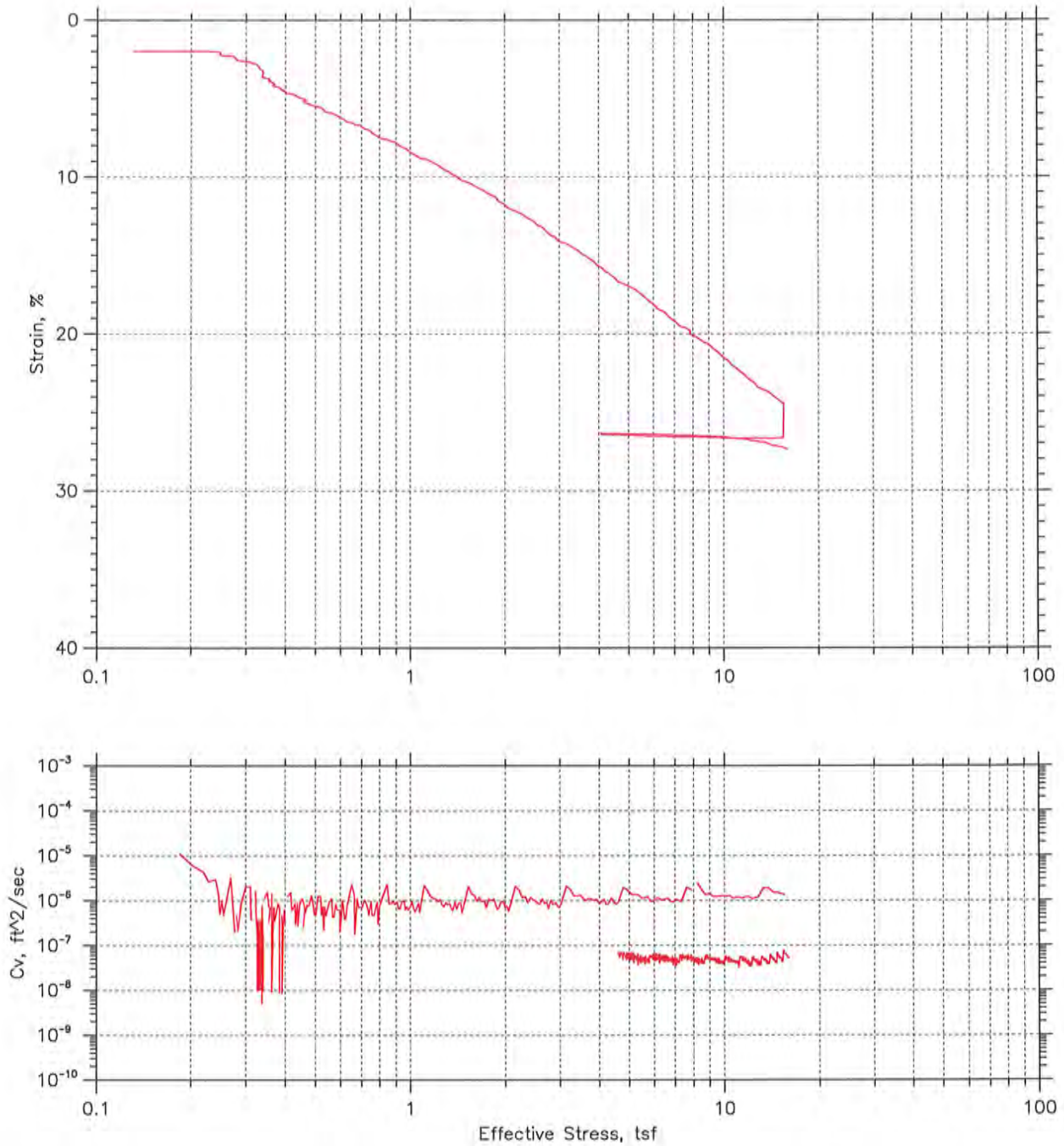
Symbol	⊖			
Sample No.	OT-2			
Test No.	UU-6			
Depth	64-66 ft			
Tested by	md			
Test Date	01/24/14			
Checked by	jdt			
Check Date	01/31/14			
Diameter, in	2.87			
Height, in	6.01			
Water Content, %	27.0			
Dry Density, pcf	95.77			
Saturation, %	93.6			
Void Ratio	0.793			
Confining Stress, tsf	3			
Undrained Strength, tsf	0.2538			
Max. Dev. Stress, tsf	0.5076			
Strain at Failure, %	12.2			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.75			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

	Project: Silverline	
	Location: Chelsea, MA	
	Project No.: GTX-301232	
	Boring No.: B-51	
	Sample Type: intact	
	Description: Moist, greenish gray clay with sand	
	Remarks: System W	

Phase calculations based on start and end of test.



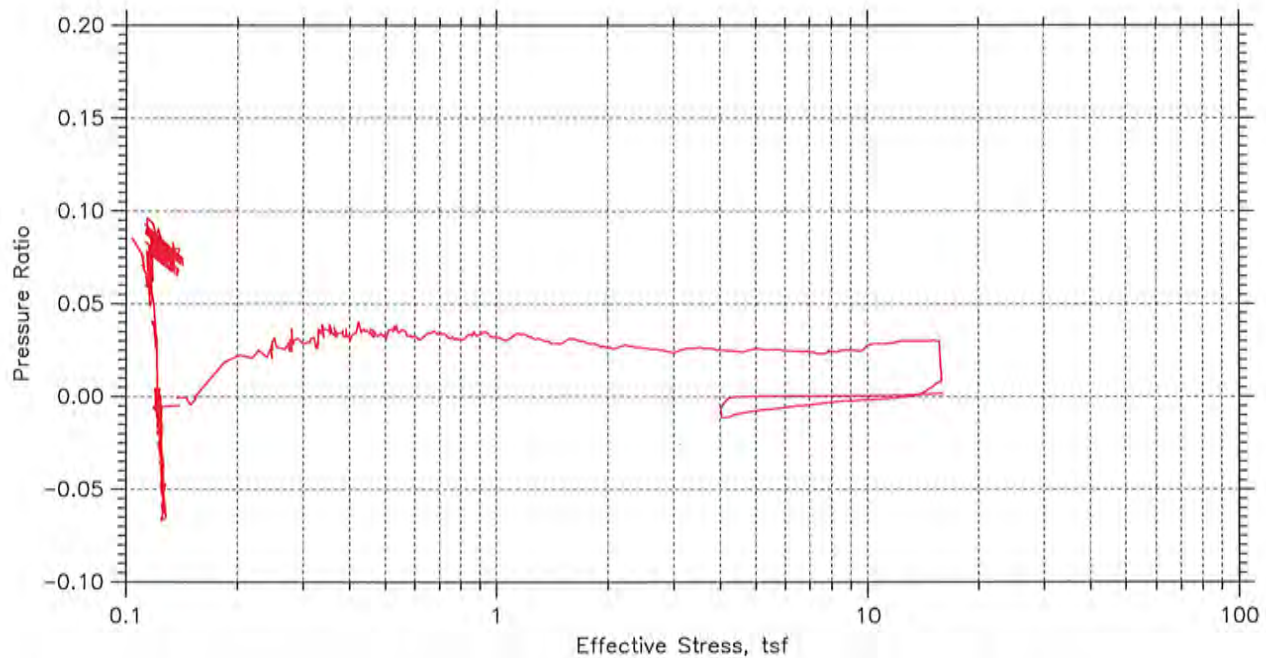
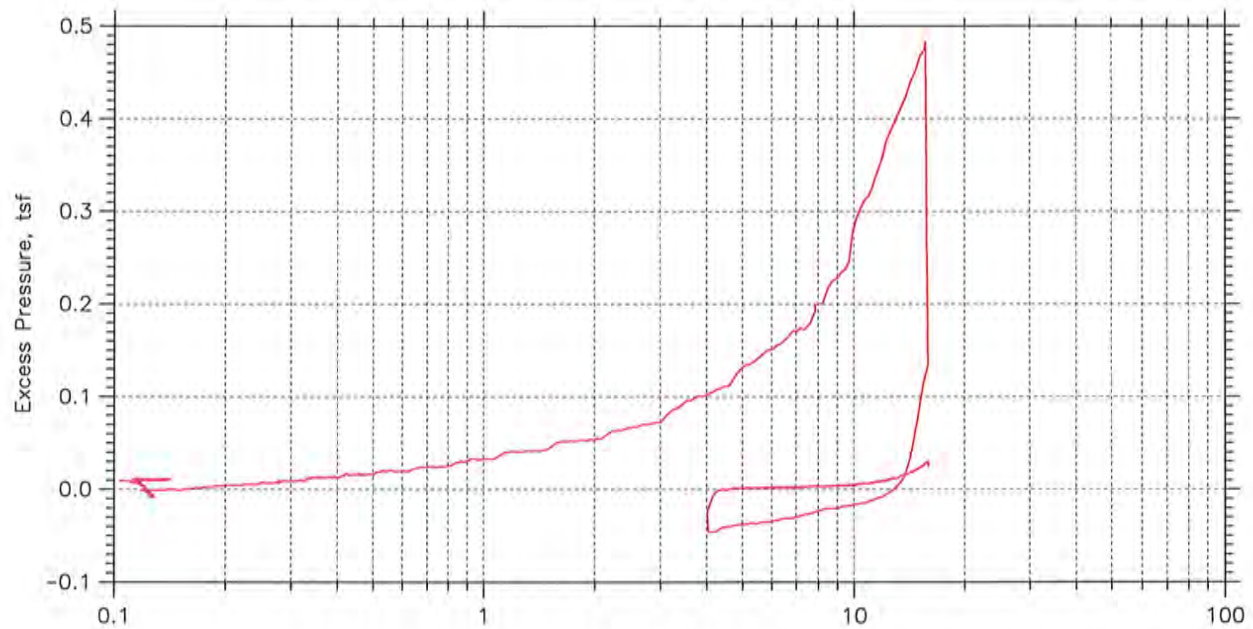
Constant Rate of Consolidation
Constant Strain Rate by ASTM D4186
Summary Report



Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-1	Tested By: md	Checked By: jdt
Sample No.: ST-5	Test Date: 11/26/13	Depth: 14-16 ft
Test No.: CRS-1	Sample Type: intact	Elevation: ---
Description: Moist, dark grayish brown silt		
Remarks: System S		



Constant Rate of Consolidation
Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-1	Tested By: md	Checked By: jdt
Sample No.: ST-5	Test Date: 11/26/13	Depth: 14-16 ft
Test No.: CRS-1	Sample Type: intact	Elevation: ---
Description: Moist, dark grayish brown silt		
Remarks: System S		



CRC TEST DATA

Project: Silverline
 Boring No.: B-1
 Sample No.: ST-5
 Test No.: CRS-1

Location: Chelsea, MA
 Tested By: md
 Test Date: 11/26/13
 Sample Type: intact

Project No.: GTX-301232
 Checked By: jdt
 Depth: 14-16 ft
 Elevation: ---

Soil Description: Moist, dark grayish brown silt
 Remarks: System S

Estimated Specific Gravity: 2.76
 Initial Void Ratio: 1.40
 Final Void Ratio: 0.779

Liquid Limit: 53
 Plastic Limit: 32
 Plasticity Index: 21

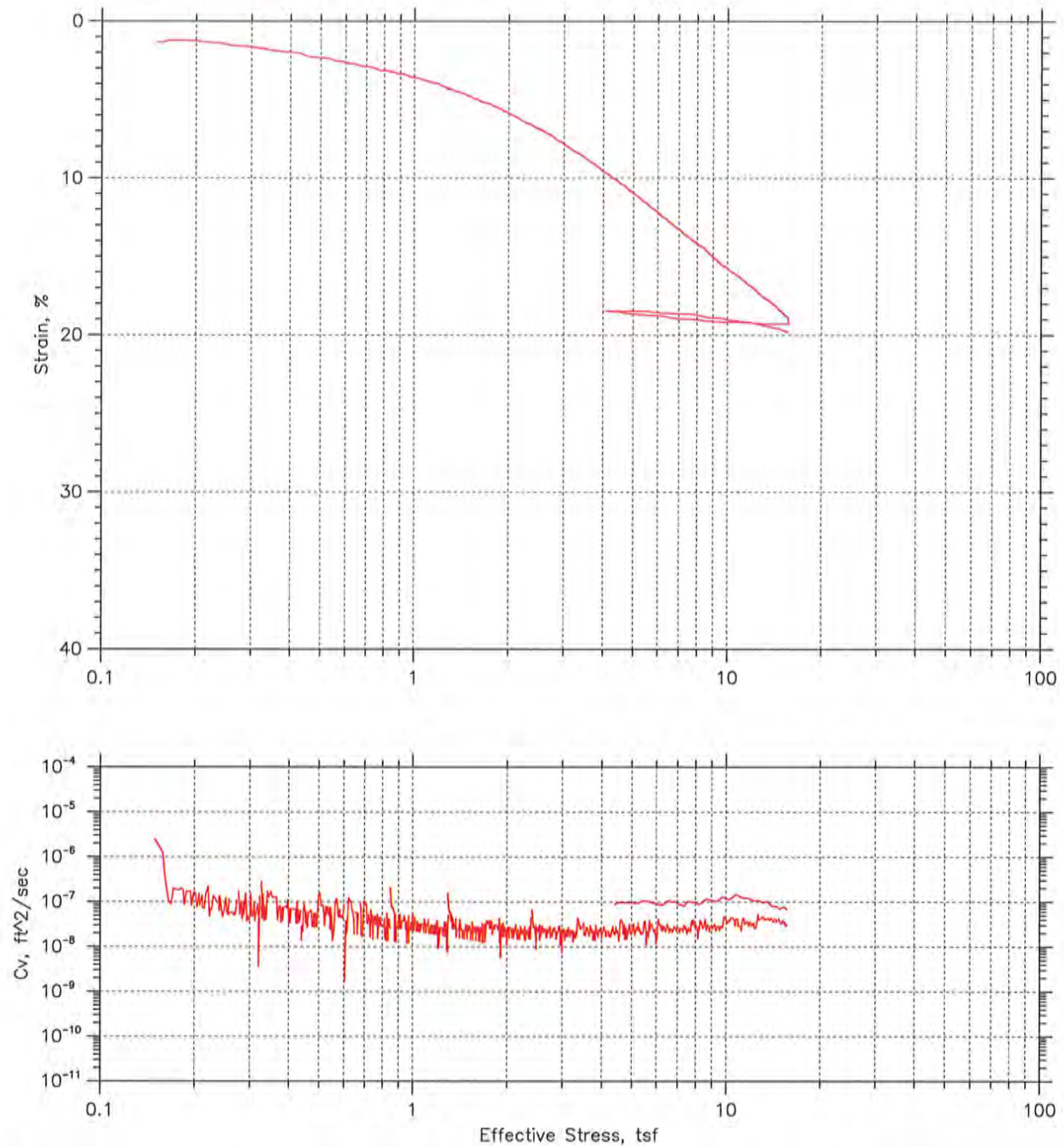
Specimen Diameter: 2.50 in
 Initial Height: 1.00 in
 Final Height: 0.74 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	12921	RING		11040
Wt. Container + Wet Soil, gm	141.94	248.20	227.85	126.90
Wt. Container + Dry Soil, gm	95.790	201.78	201.78	100.63
Wt. Container, gm	8.2200	109.60	109.60	7.7200
Wt. Dry Soil, gm	87.570	92.185	92.185	92.910
Water Content, %	52.70	50.35	28.27	28.27
Void Ratio	---	1.40	0.779	---
Degree of Saturation, %	---	98.80	100.00	---
Dry Unit Weight, pcf	---	71.543	96.680	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



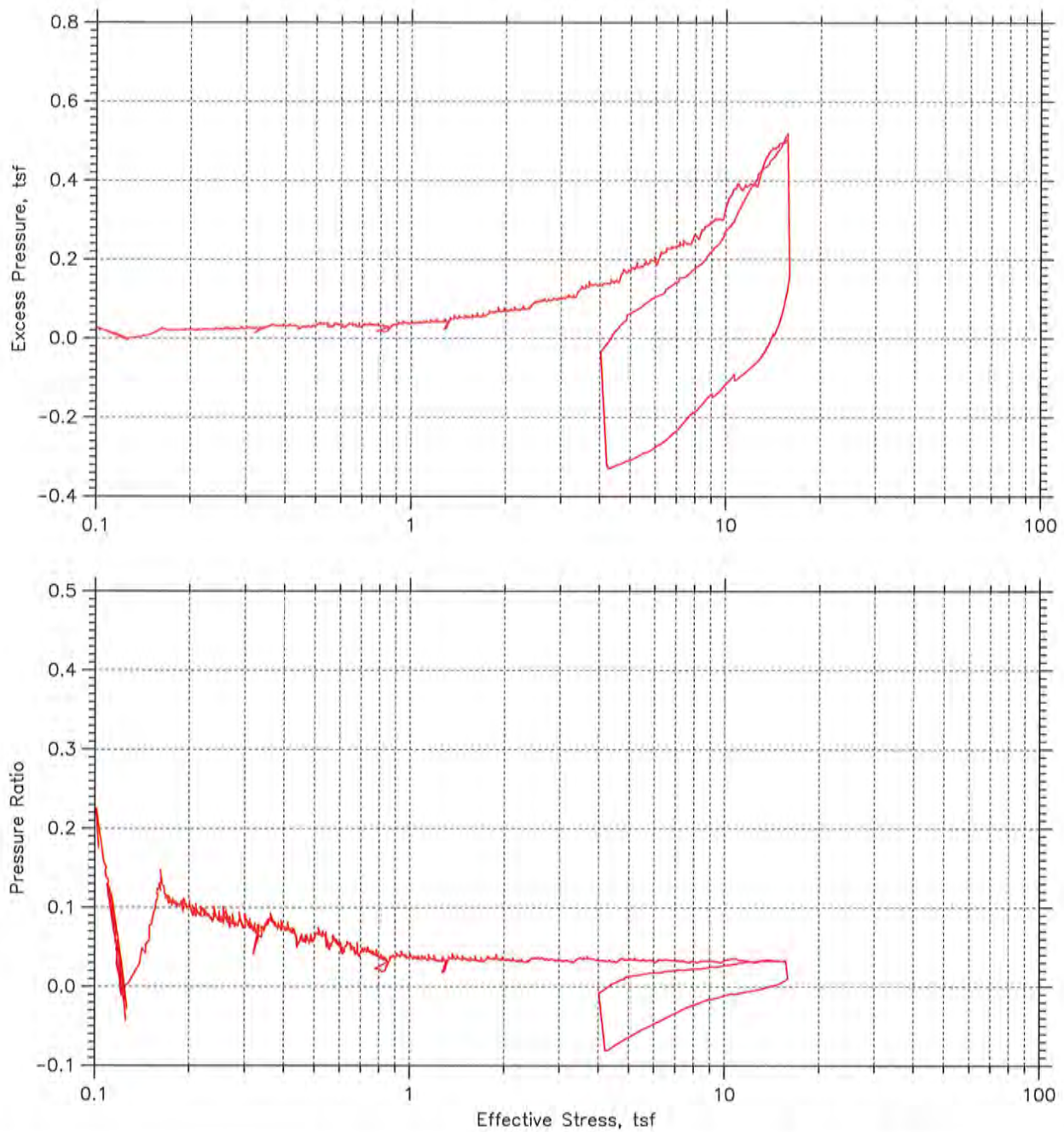
Constant Rate of Consolidation
Constant Strain Rate by ASTM D4186
Summary Report



Project: Silver Line	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-47	Tested By: md	Checked By: jdt
Sample No.: OT-5	Test Date: 12/19/13	Depth: 44-46 ft
Test No.: CRC-2	Sample Type: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System K		



Constant Rate of Consolidation
Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Silver Line	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-47	Tested By: md	Checked By: jdt
Sample No.: OT-5	Test Date: 12/19/13	Depth: 44-46 ft
Test No.: CRC-2	Sample Type: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System K		



CRC TEST DATA

Project: Silver Line
 Boring No.: B-47
 Sample No.: OT-5
 Test No.: CRC-2

Location: Chelsea, MA
 Tested By: md
 Test Date: 12/19/13
 Sample Type: intact

Project No.: GTX-301232
 Checked By: jdt
 Depth: 44-46 ft
 Elevation: ---

Soil Description: Moist, greenish gray clay
 Remarks: System K

Estimated Specific Gravity: 2.79
 Initial Void Ratio: 1.24
 Final Void Ratio: 0.816

Liquid Limit: ---
 Plastic Limit: ---
 Plasticity Index: ---

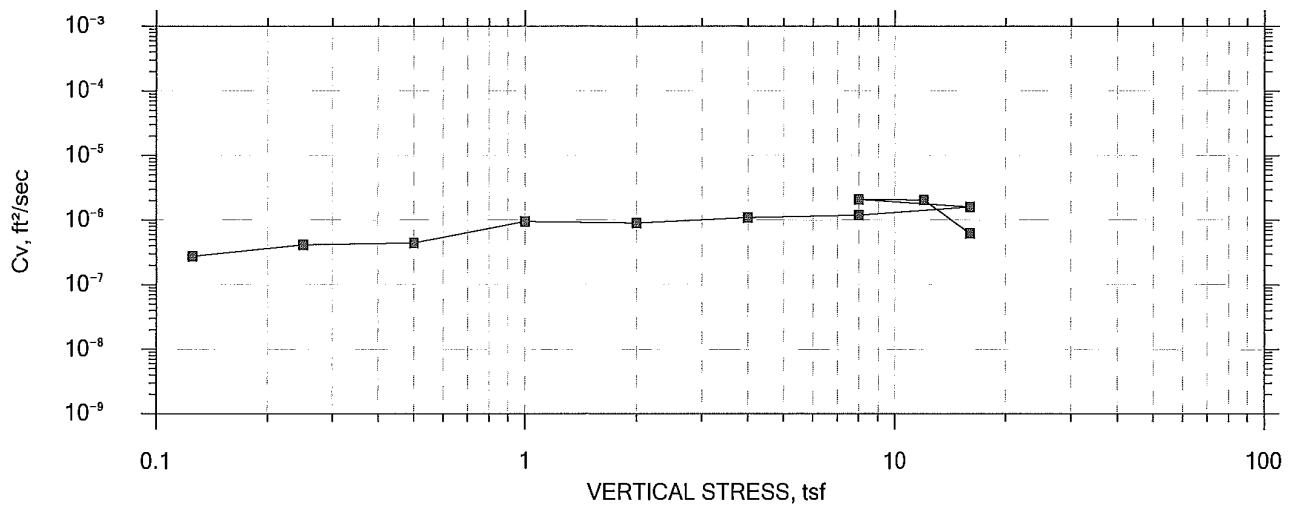
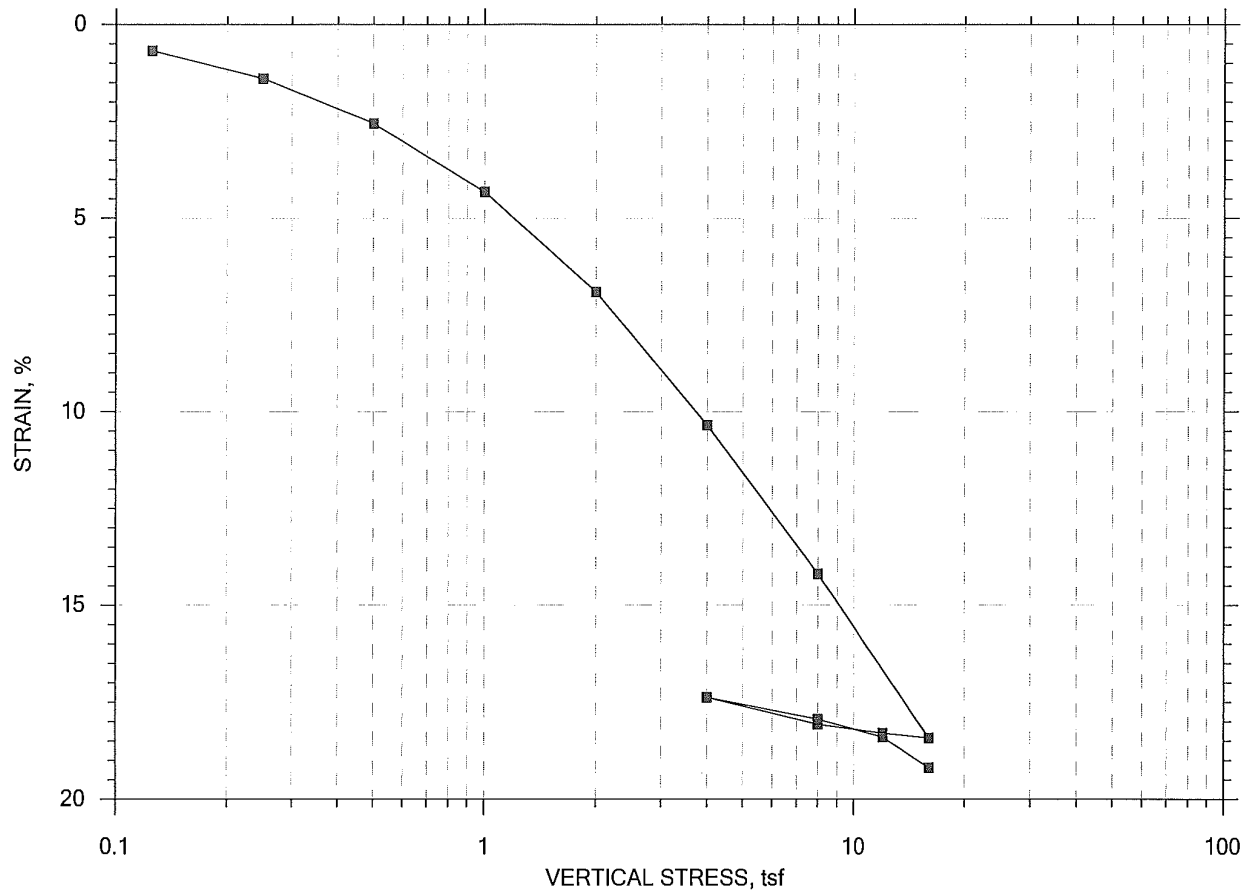
Specimen Diameter: 2.50 in
 Initial Height: 1.00 in
 Final Height: 0.81 in


	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	13452	RING		13234
Wt. Container + Wet Soil, gm	223.81	354.98	340.40	138.49
Wt. Container + Dry Soil, gm	155.19	311.13	311.13	109.03
Wt. Container, gm	8.2900	211.07	211.07	8.3300
Wt. Dry Soil, gm	146.90	100.06	100.06	100.70
Water Content, %	46.71	43.83	29.26	29.26
Void Ratio	---	1.24	0.816	---
Degree of Saturation, %	---	98.42	100.00	---
Dry Unit Weight, pcf	---	77.653	95.868	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

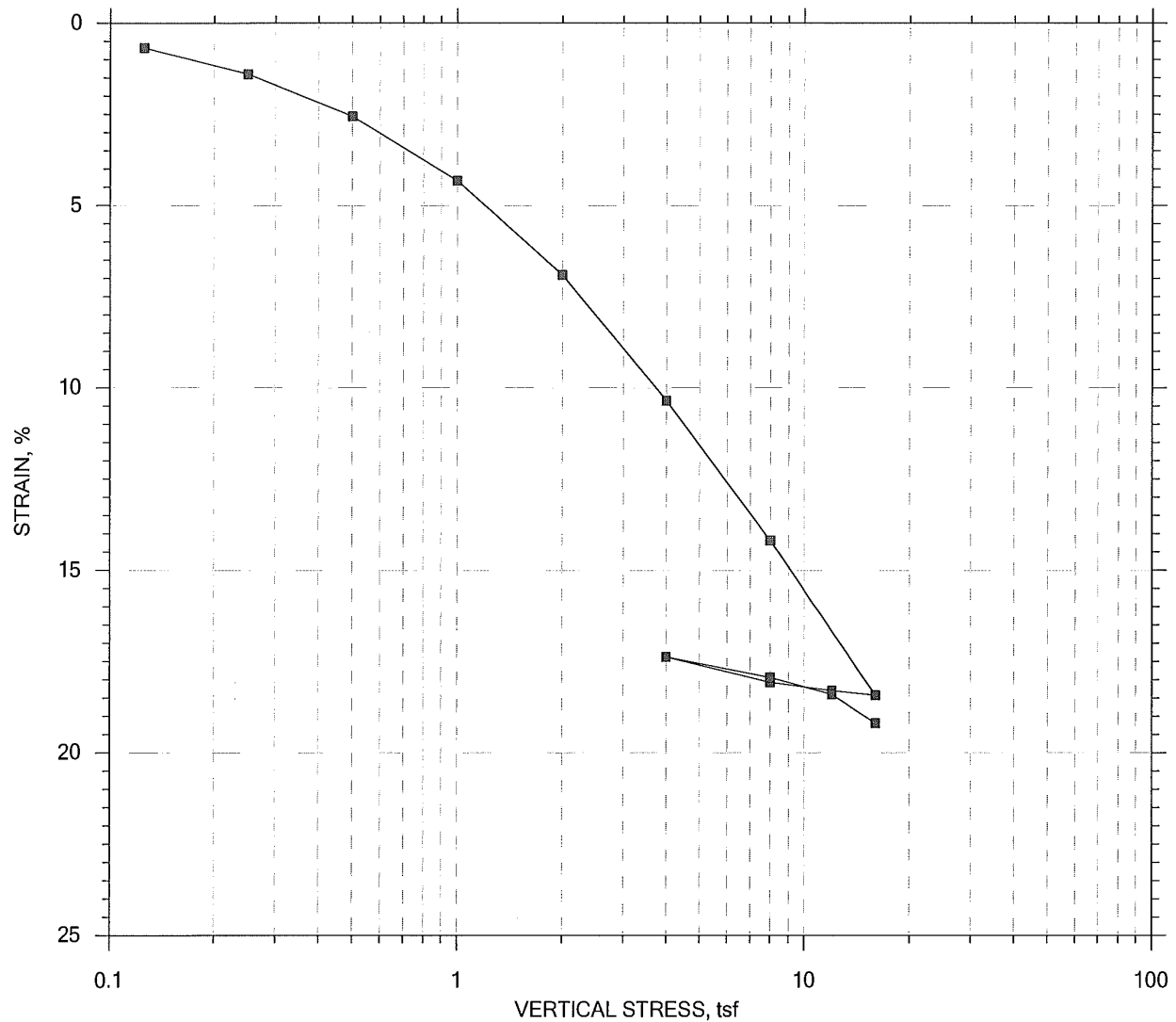
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test	
Current Vertical Effective Stress: ---			Water Content, %	37.88	23.57	
Preconsolidation Stress: ---			Dry Unit Weight, pcf	84.099	105.12	
Compression Ratio: ---			Saturation, %	98.61	100.00	
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.07	0.66
LL: ---	PL: ---	PI: ---	GS: 2.79			

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-1
Test No.: IP-1

Location: Chelsea, MA
Tested By: md
Test Date: 12/19/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 24-26 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System Q

Estimated Specific Gravity: 2.79
Initial Void Ratio: 1.07
Final Void Ratio: 0.658

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.80 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	13470	RING		12809
Wt. Container + Wet Soil, gm	264.77	258.50	242.99	143.69
Wt. Container + Dry Soil, gm	192.91	217.45	217.45	117.85
Wt. Container, gm	8.1300	109.09	109.09	8.2000
Wt. Dry Soil, gm	184.78	108.36	108.36	109.65
Water Content, %	38.89	37.88	23.57	23.57
Void Ratio	----	1.07	0.658	---
Degree of Saturation, %	----	98.61	100.00	---
Dry Unit Weight, pcf	----	84.099	105.12	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-1
Test No.: IP-1

Location: Chelsea, MA
Tested By: md
Test Date: 12/19/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 24-26 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System Q

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.125	0.006768	1.06	0.677	97.579	2.50e-007	5.41e-002	3.65e-005	
2	0.250	0.01398	1.04	1.40	65.062	3.69e-007	5.77e-002	5.75e-005	
3	0.500	0.02553	1.02	2.55	44.918	5.25e-007	4.62e-002	6.54e-005	
4	1.00	0.04319	0.983	4.32	25.996	8.80e-007	3.53e-002	8.39e-005	
5	2.00	0.06901	0.929	6.90	24.635	8.87e-007	2.58e-002	6.18e-005	
6	4.00	0.1034	0.858	10.3	16.047	1.28e-006	1.72e-002	5.93e-005	
7	8.00	0.1418	0.779	14.2	14.461	1.31e-006	9.59e-003	3.38e-005	
8	16.0	0.1842	0.691	18.4	10.233	1.68e-006	5.29e-003	2.40e-005	
9	12.0	0.1829	0.693	18.3	1.963	8.33e-006	3.10e-004	6.97e-006	
10	8.00	0.1807	0.698	18.1	5.527	2.97e-006	5.60e-004	4.49e-006	
11	4.00	0.1737	0.712	17.4	9.878	1.68e-006	1.74e-003	7.90e-006	
12	8.00	0.1793	0.701	17.9	8.604	1.93e-006	1.40e-003	7.33e-006	
13	12.0	0.1840	0.691	18.4	10.089	1.63e-006	1.16e-003	5.11e-006	
14	16.0	0.1918	0.675	19.2	26.987	6.00e-007	1.96e-003	3.17e-006	

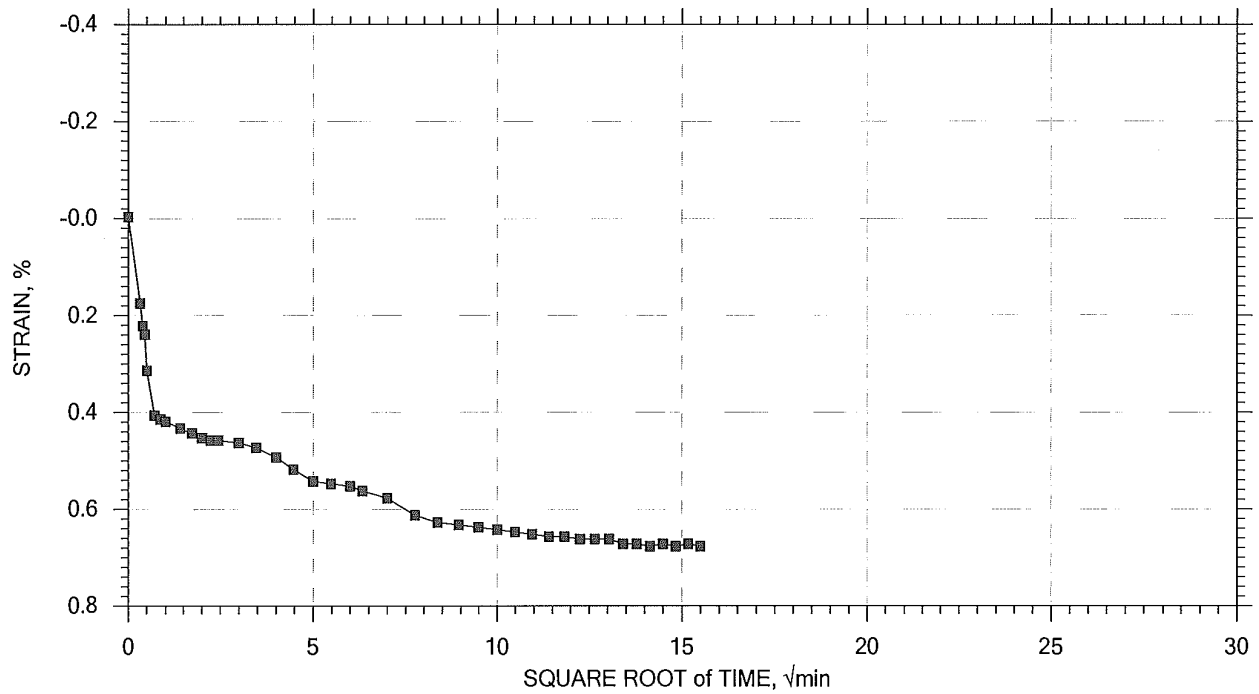
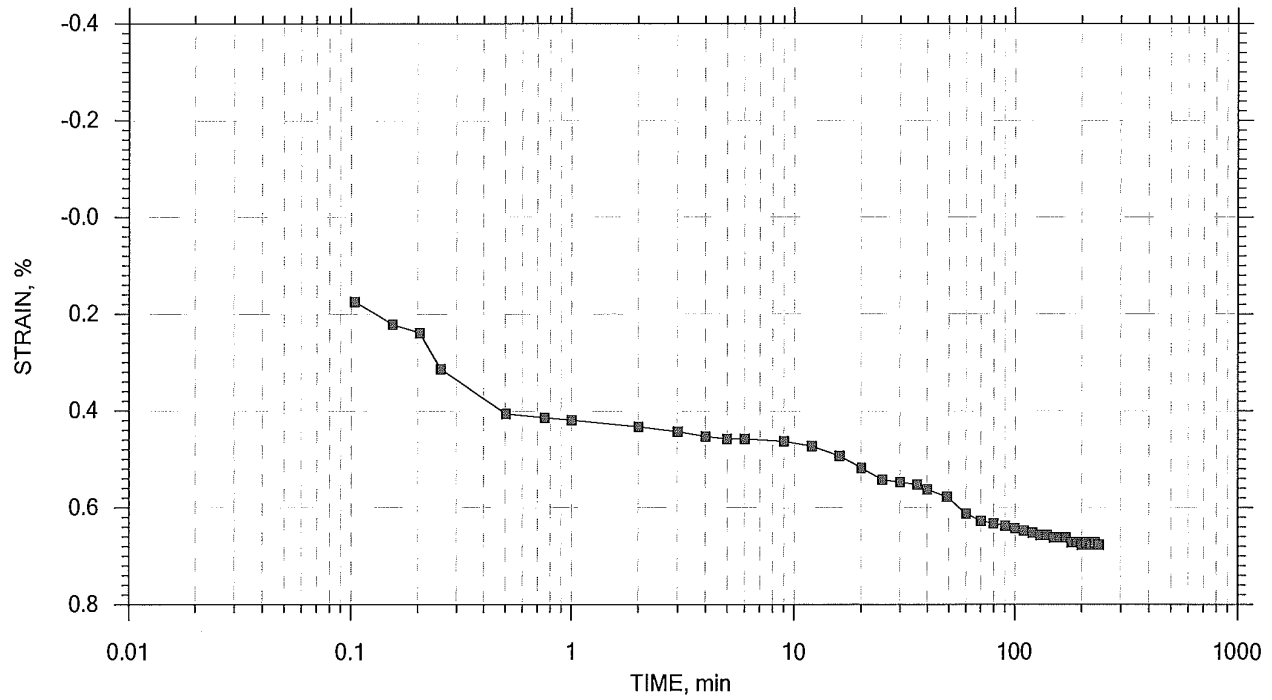
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.125	0.006768	1.06	0.677	0.000	0.00e+000	5.41e-002	0.00e+000	0.00e+000
2	0.250	0.01398	1.04	1.40	0.000	0.00e+000	5.77e-002	0.00e+000	0.00e+000
3	0.500	0.02553	1.02	2.55	12.504	4.38e-007	4.62e-002	5.45e-005	0.00e+000
4	1.00	0.04319	0.983	4.32	0.000	0.00e+000	3.53e-002	0.00e+000	0.00e+000
5	2.00	0.06901	0.929	6.90	0.000	0.00e+000	2.58e-002	0.00e+000	0.00e+000
6	4.00	0.1034	0.858	10.3	4.852	9.81e-007	1.72e-002	4.55e-005	0.00e+000
7	8.00	0.1418	0.779	14.2	4.090	1.07e-006	9.59e-003	2.77e-005	0.00e+000
8	16.0	0.1842	0.691	18.4	2.661	1.50e-006	5.29e-003	2.14e-005	0.00e+000
9	12.0	0.1829	0.693	18.3	0.000	0.00e+000	3.10e-004	0.00e+000	0.00e+000
10	8.00	0.1807	0.698	18.1	0.000	0.00e+000	5.60e-004	0.00e+000	0.00e+000
11	4.00	0.1737	0.712	17.4	1.712	2.25e-006	1.74e-003	1.06e-005	0.00e+000
12	8.00	0.1793	0.701	17.9	0.000	0.00e+000	1.40e-003	0.00e+000	0.00e+000
13	12.0	0.1840	0.691	18.4	1.608	2.37e-006	1.16e-003	7.45e-006	0.00e+000
14	16.0	0.1918	0.675	19.2	0.000	0.00e+000	1.96e-003	0.00e+000	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 14

Stress: 0.125 tsf



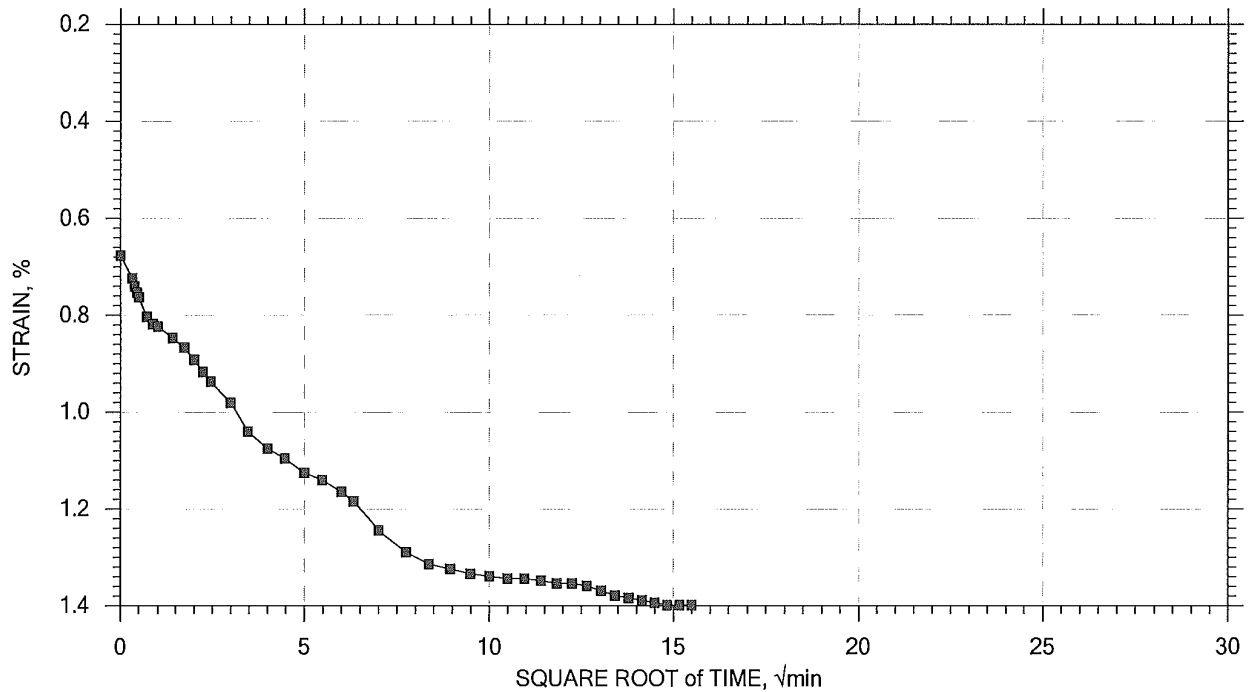
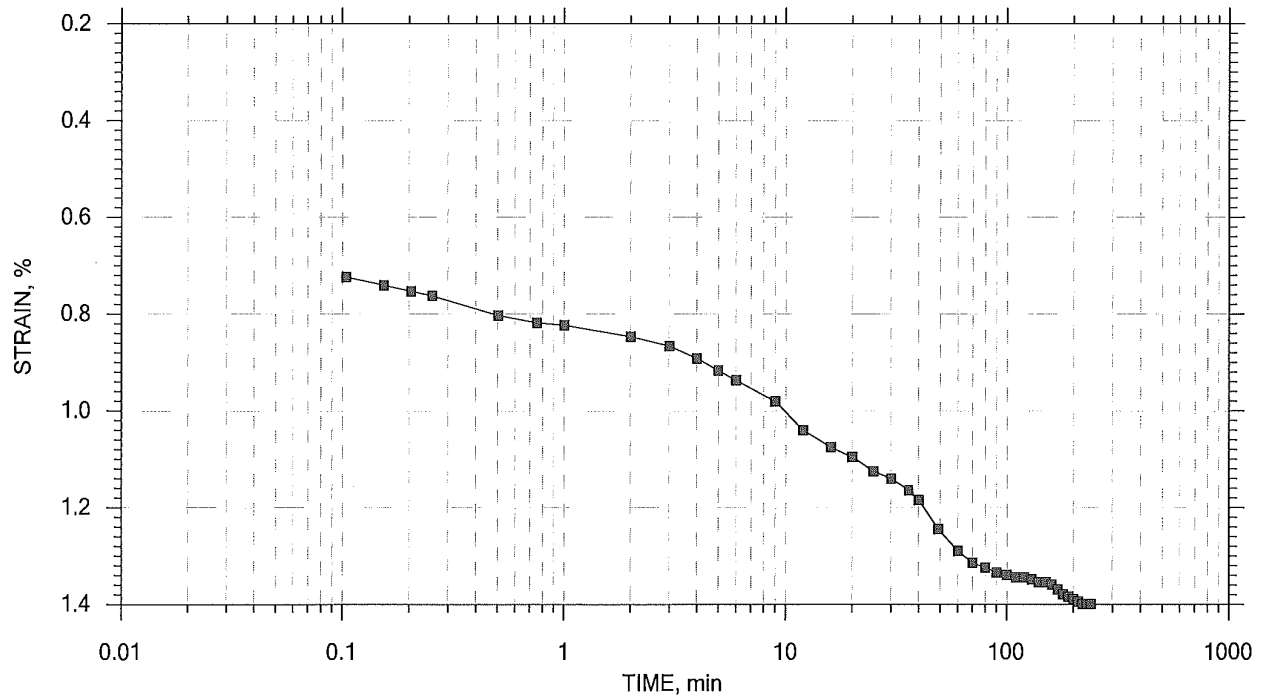
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 14

Stress: 0.25 tsf



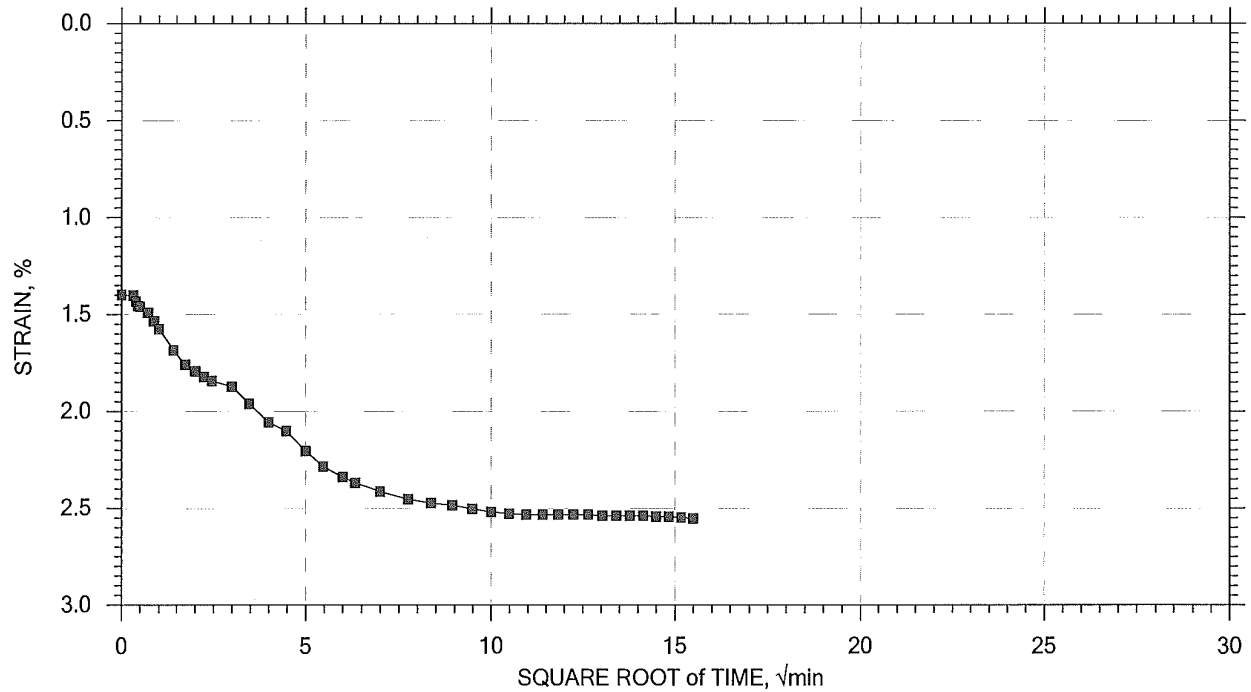
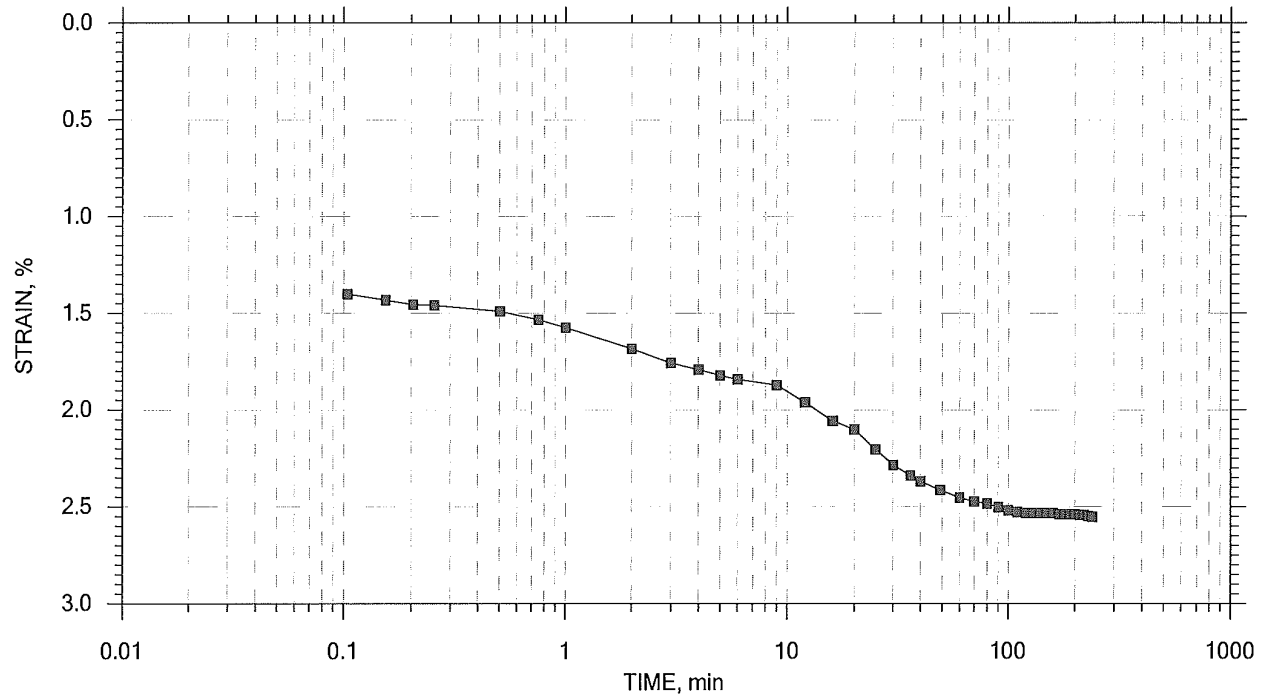
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 14

Stress: 0.5 tsf



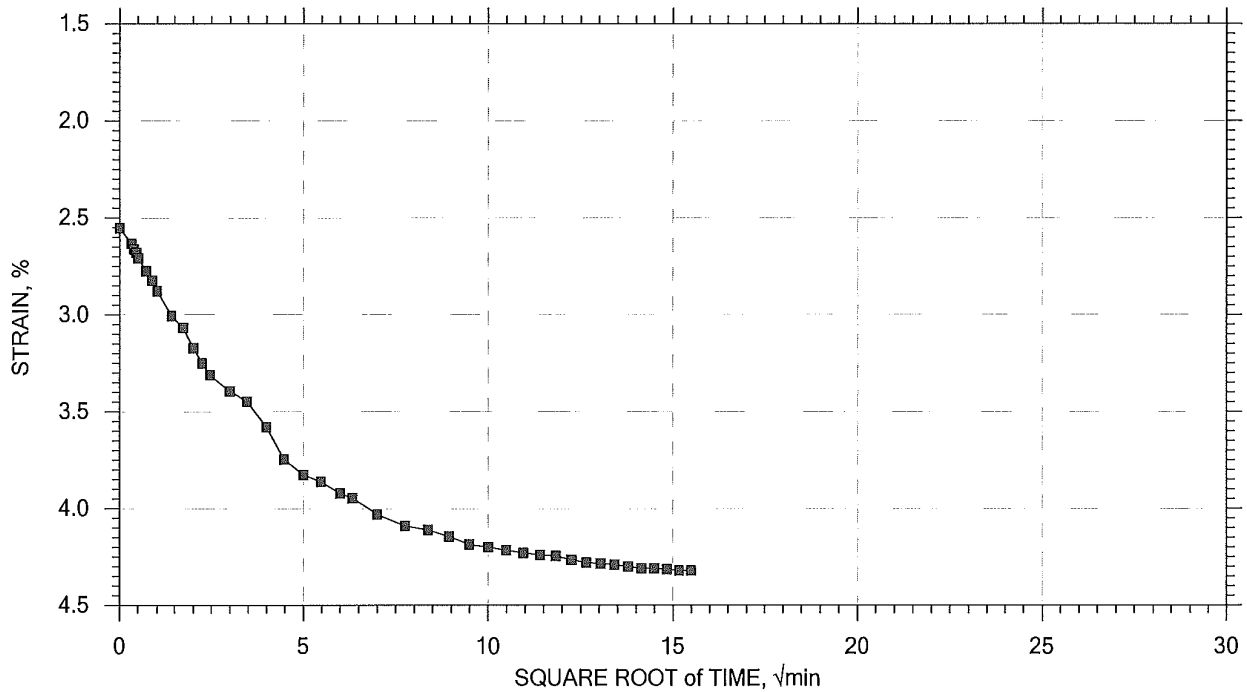
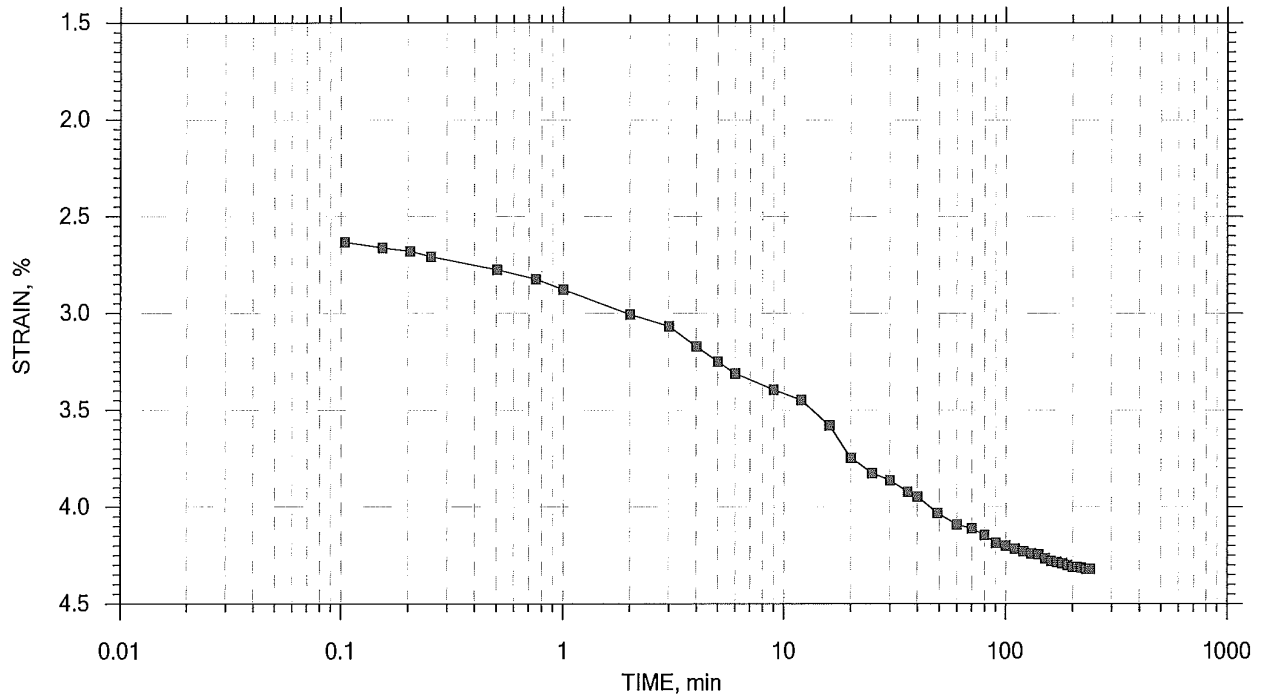
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 14

Stress: 1 tsf



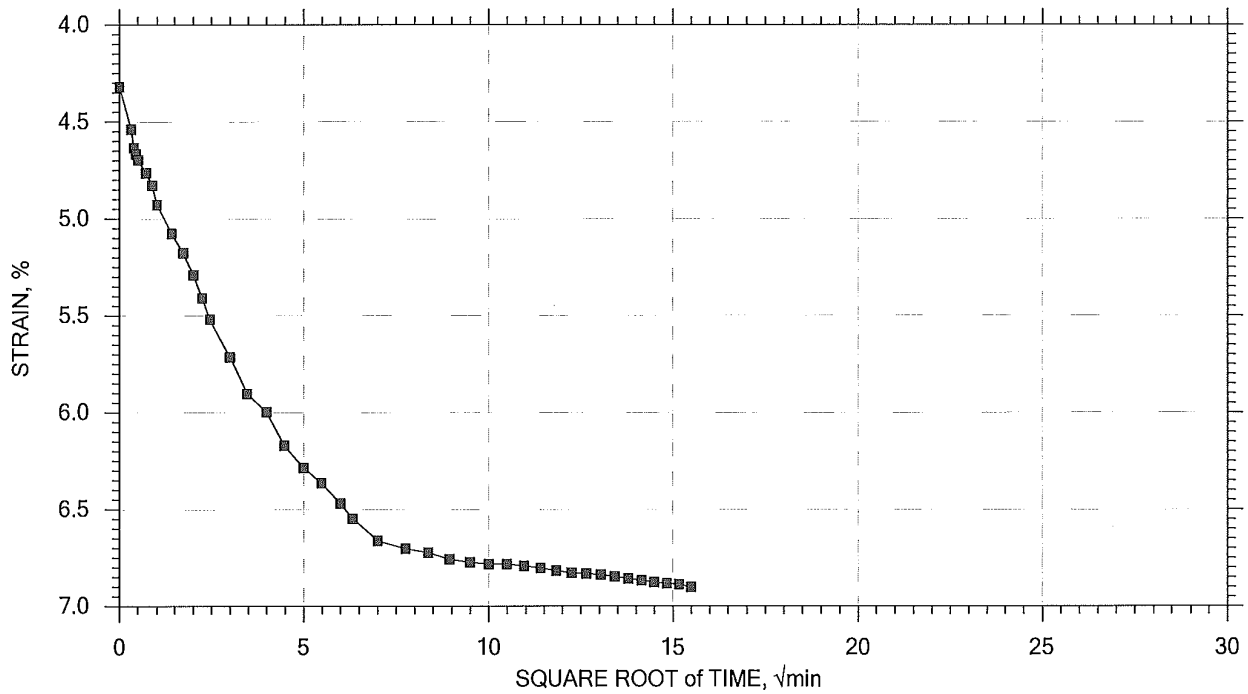
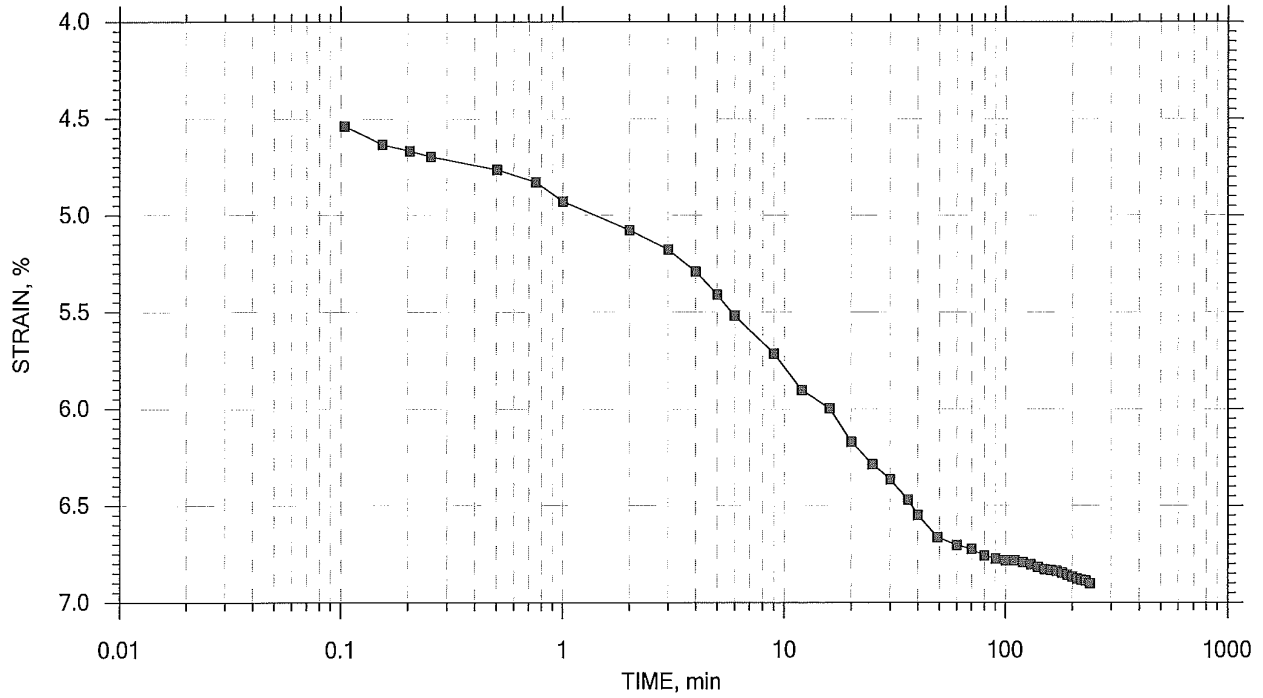
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 14

Stress: 2 tsf



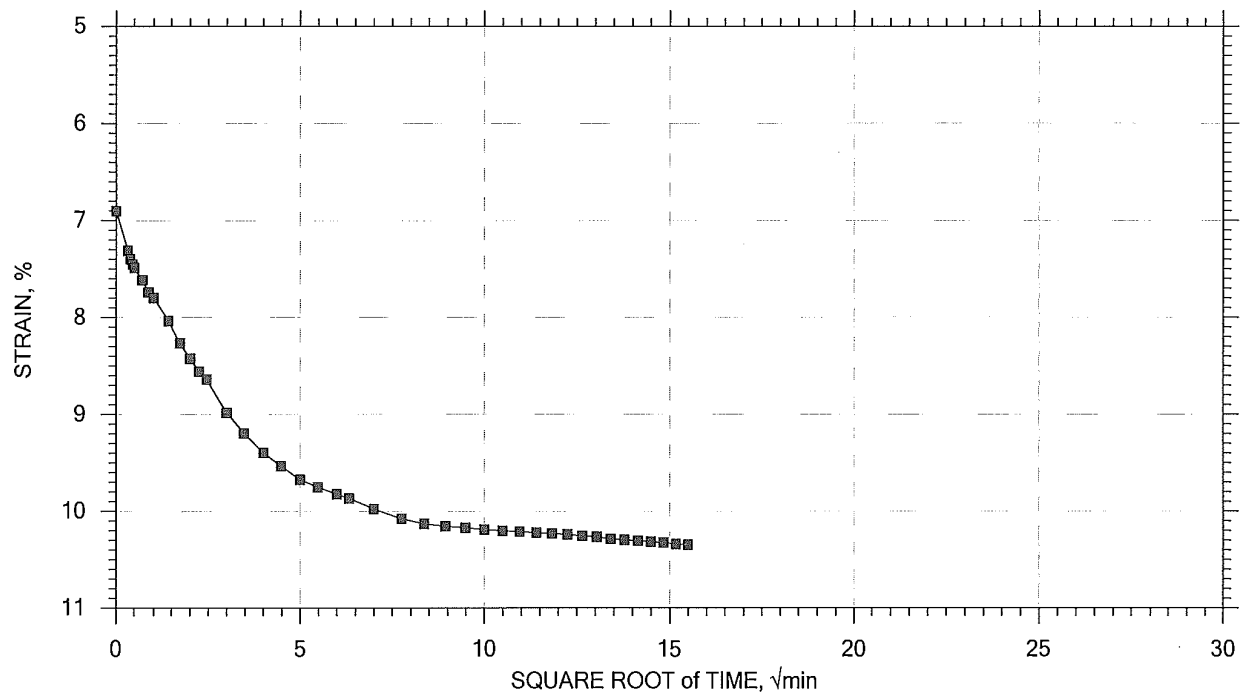
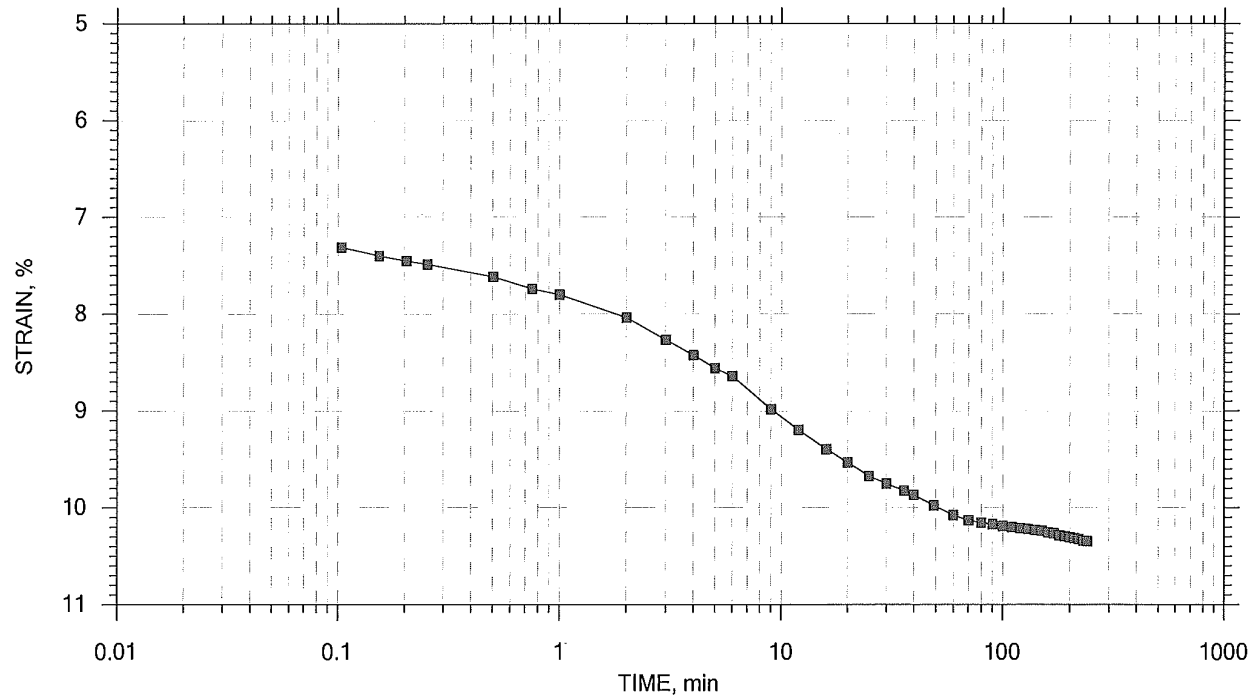
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 14

Stress: 4 tsf



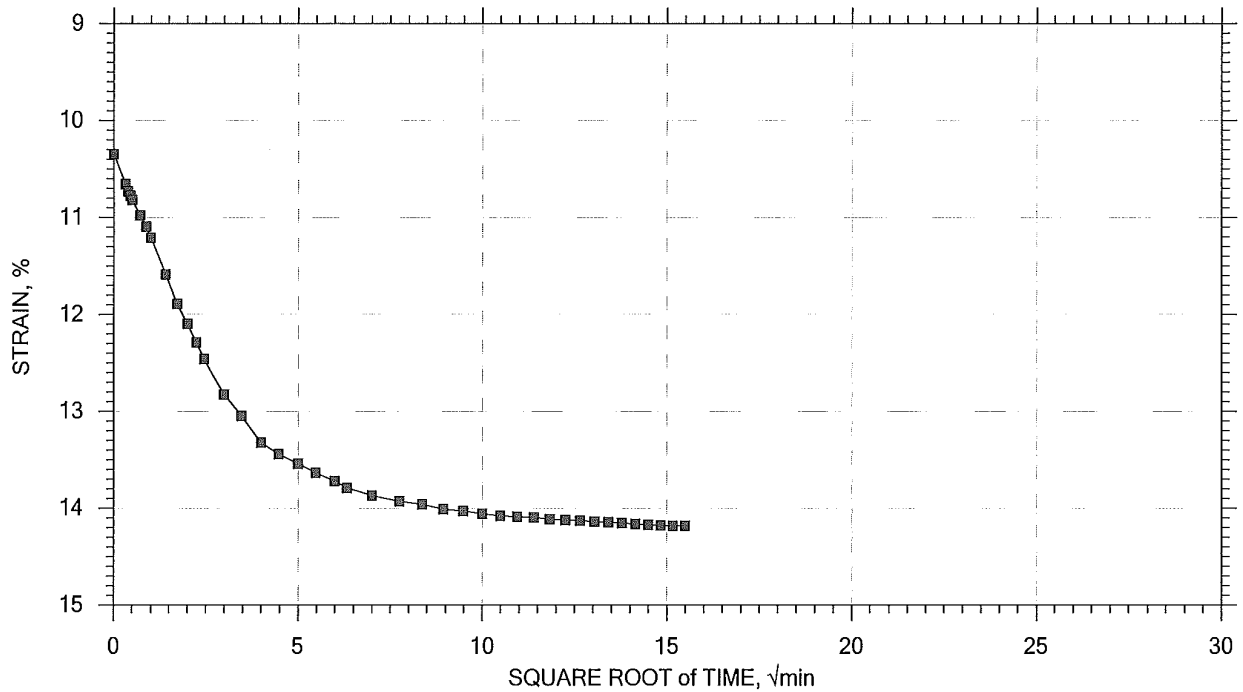
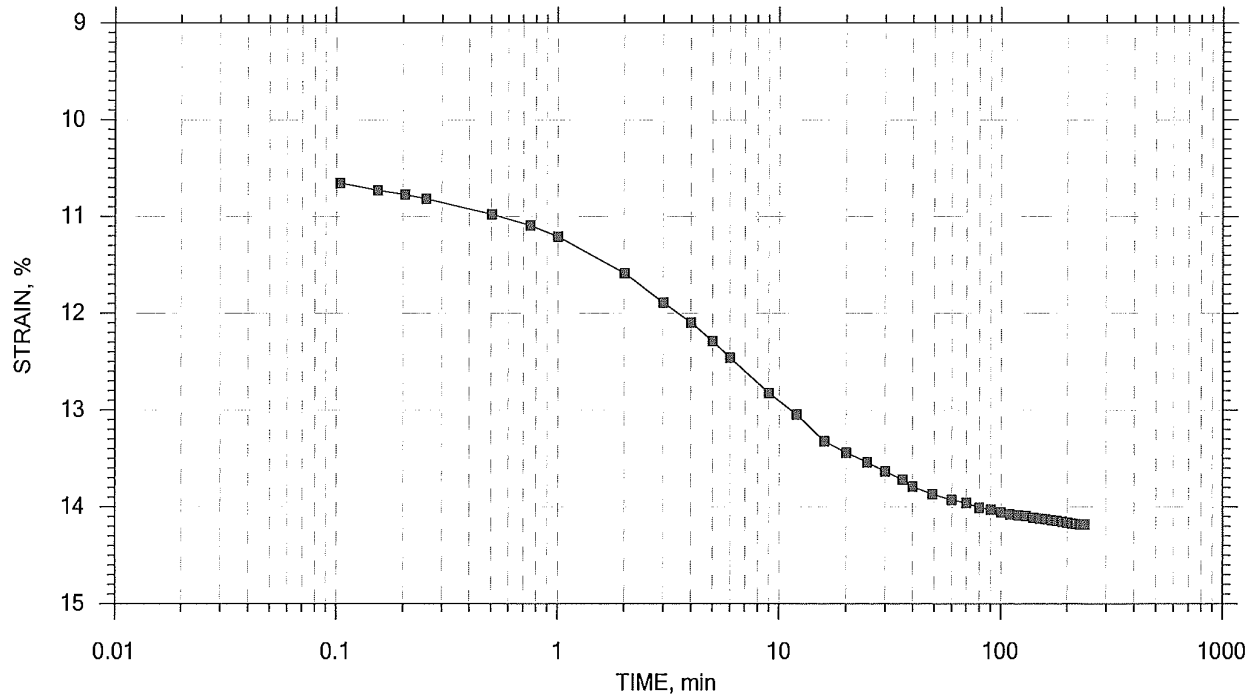
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 14

Stress: 8 tsf



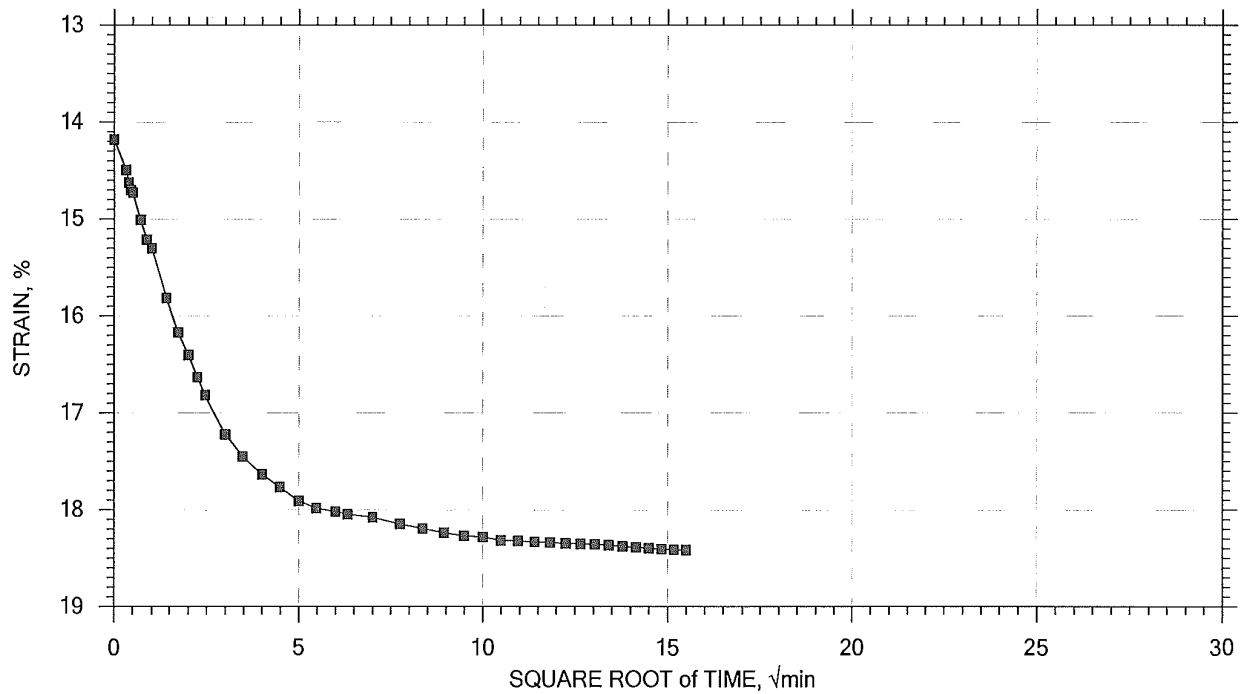
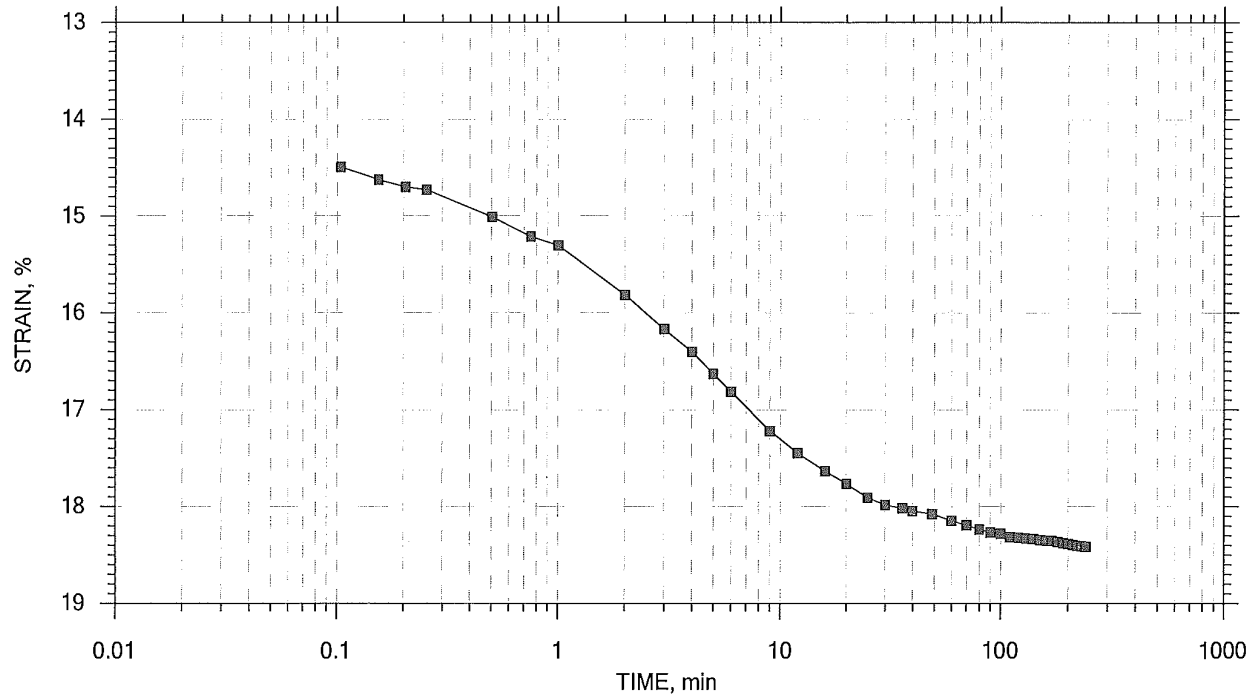
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 14

Stress: 16 tsf



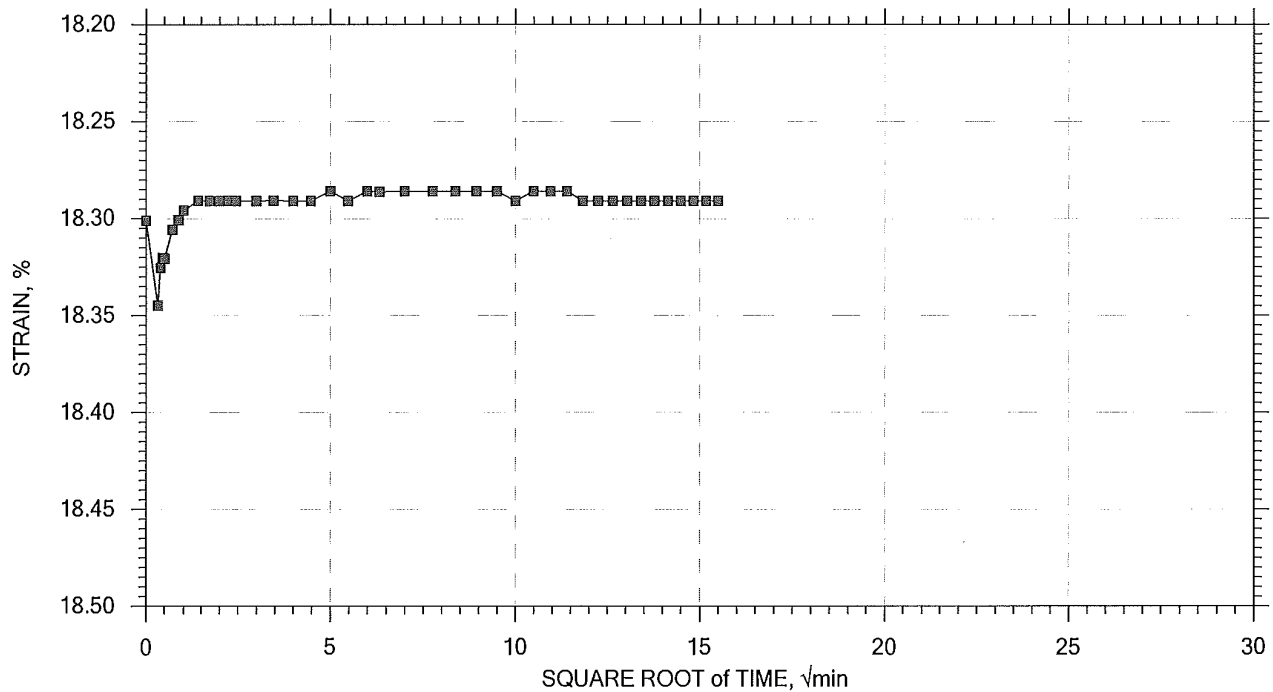
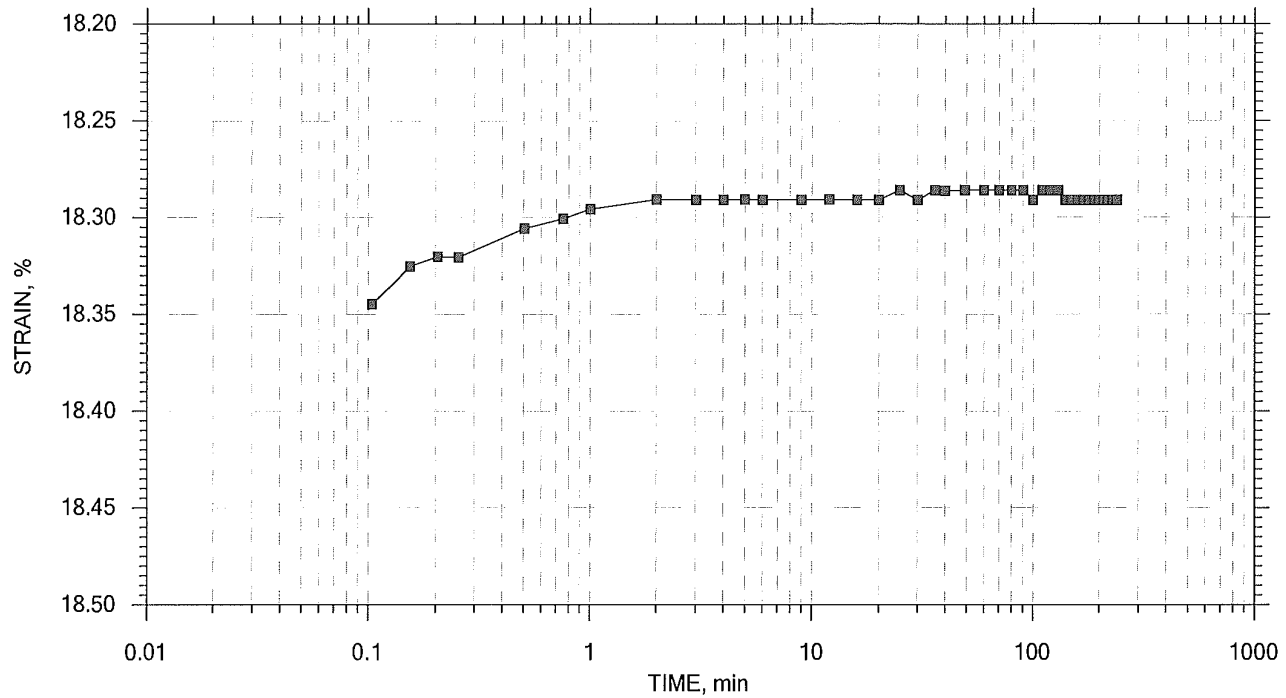
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 14

Stress: 12 tsf



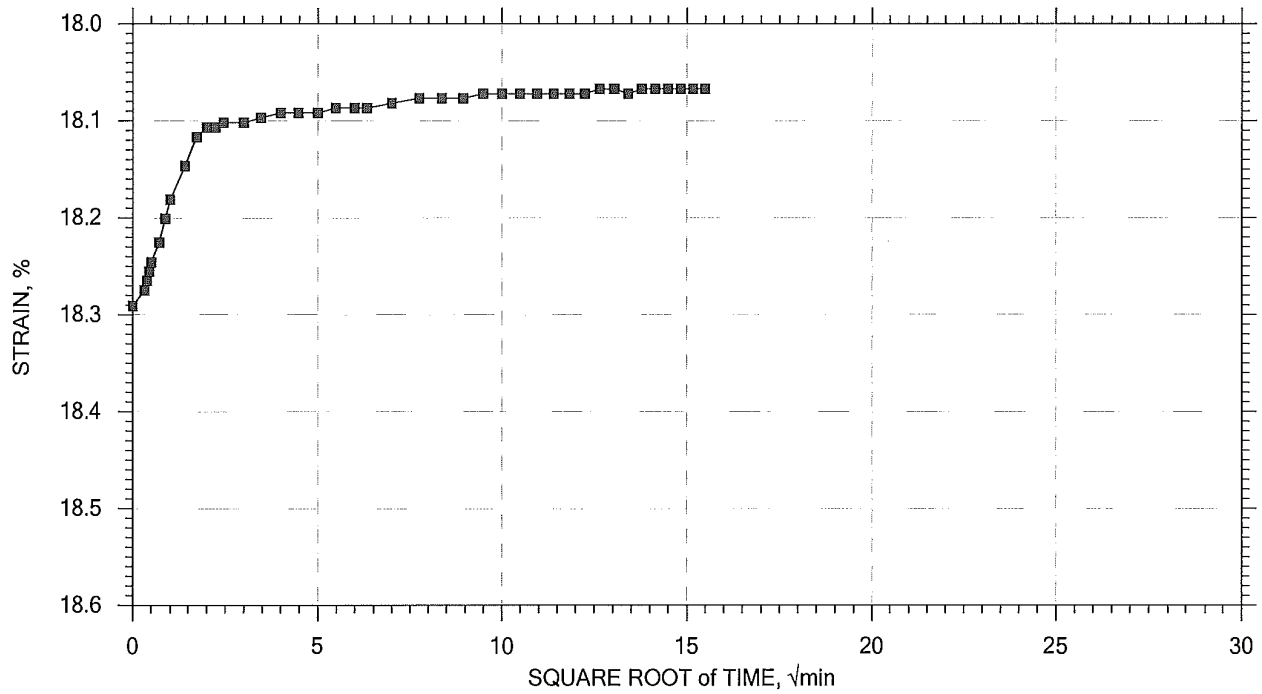
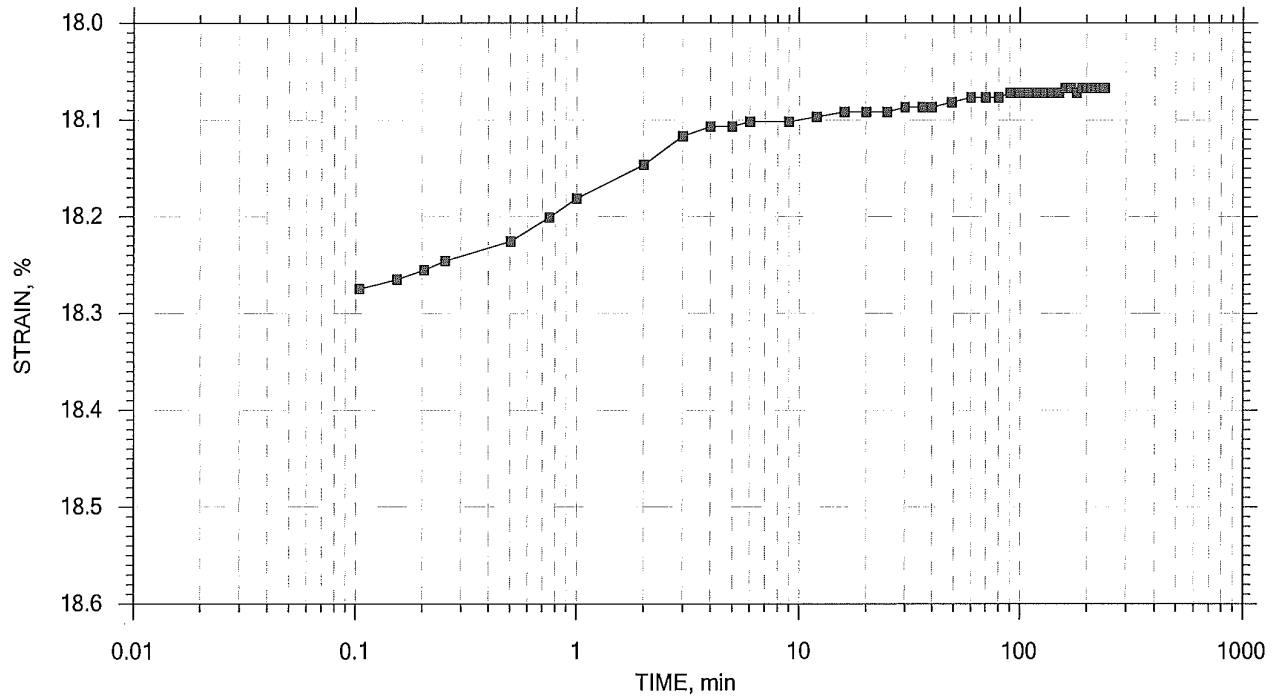
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 14

Stress: 8 tsf



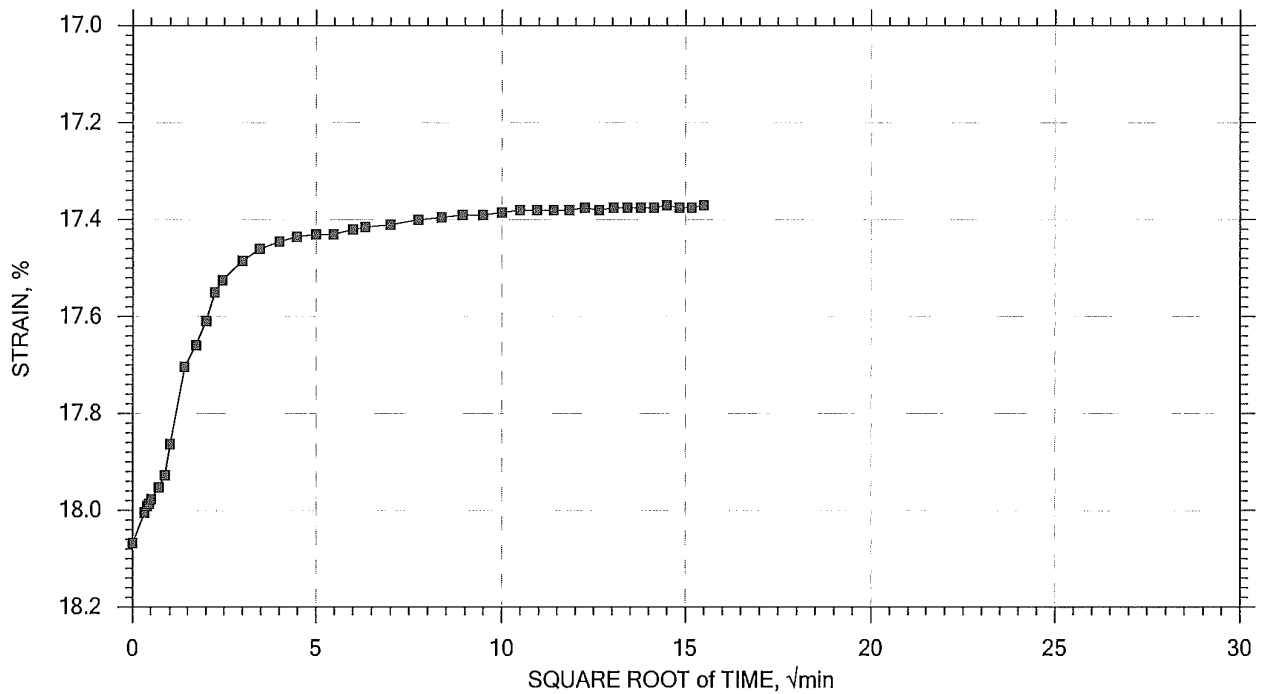
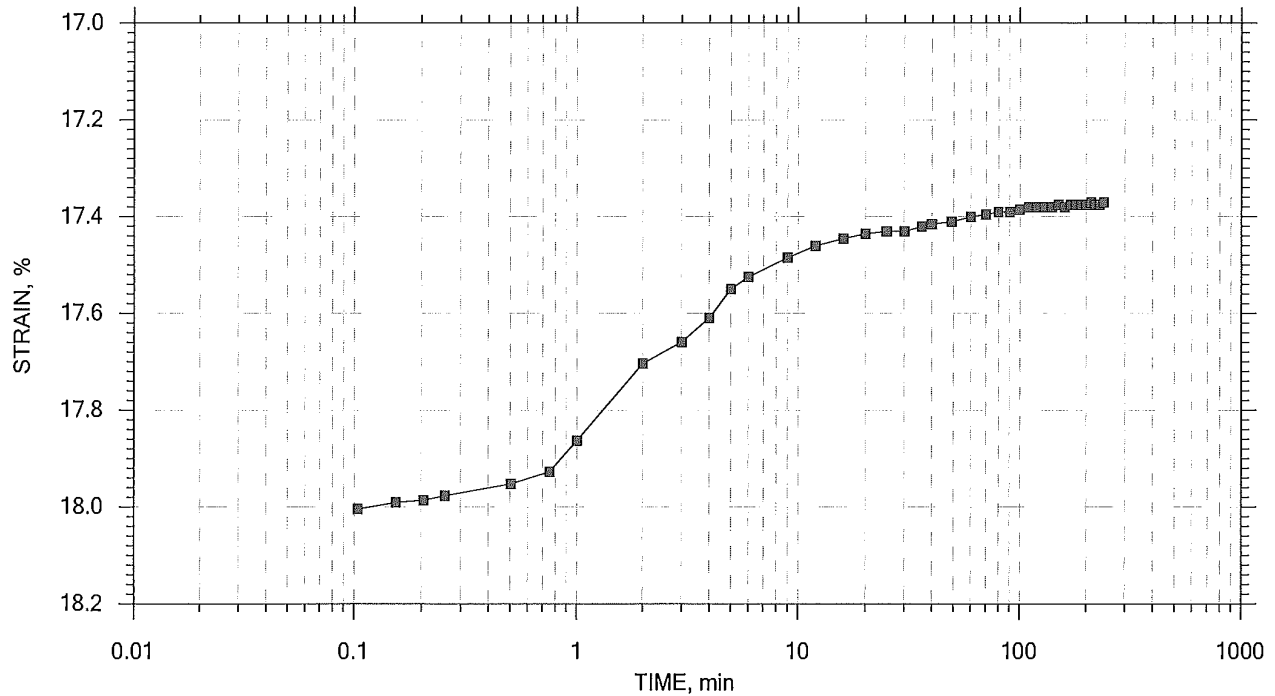
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 14

Stress: 4 tsf



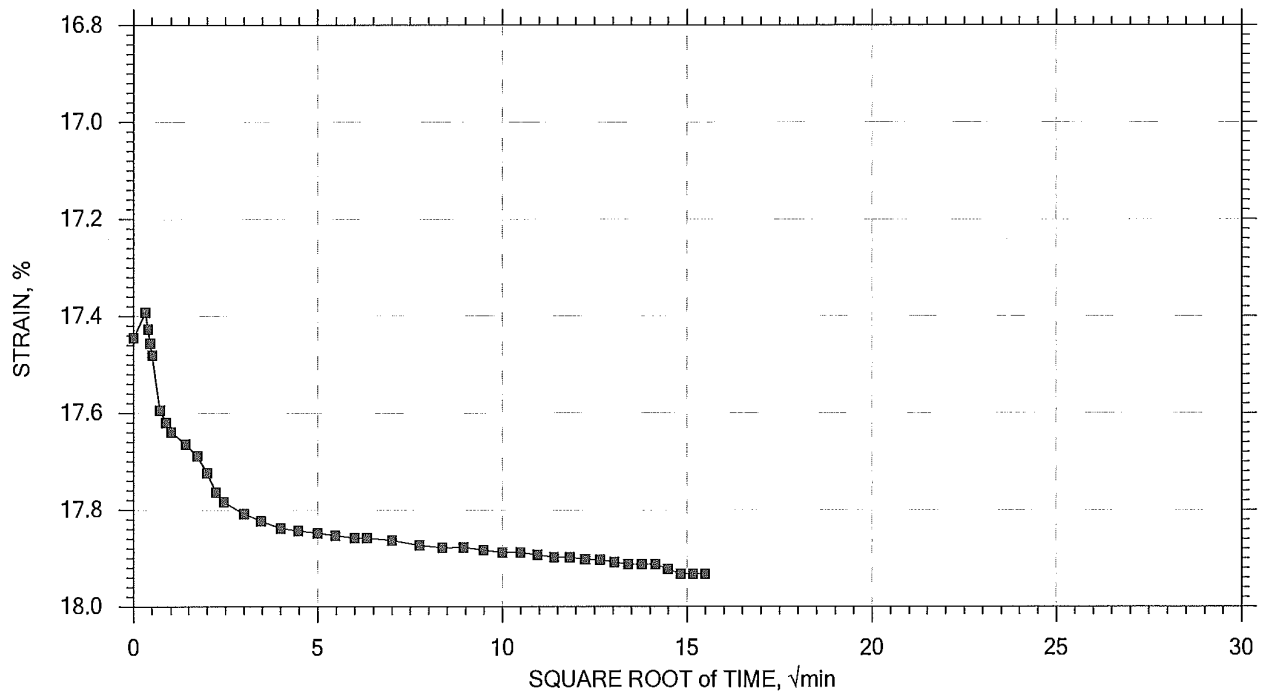
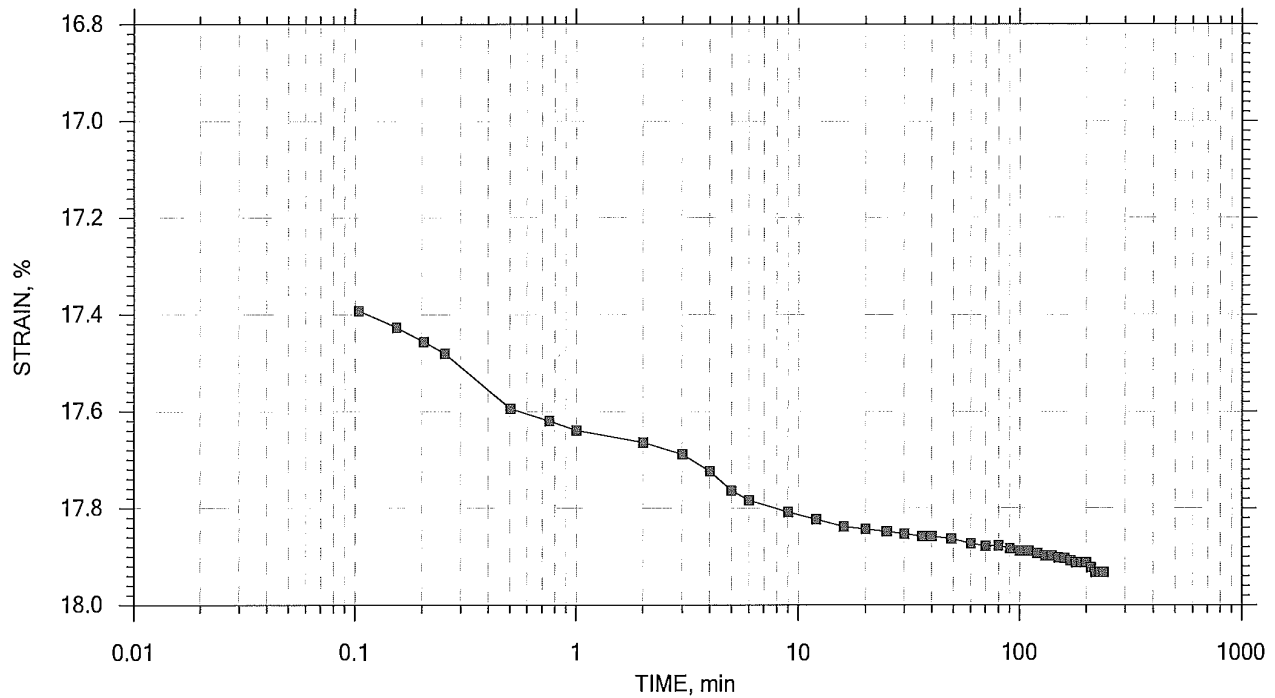
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 14

Stress: 8 tsf



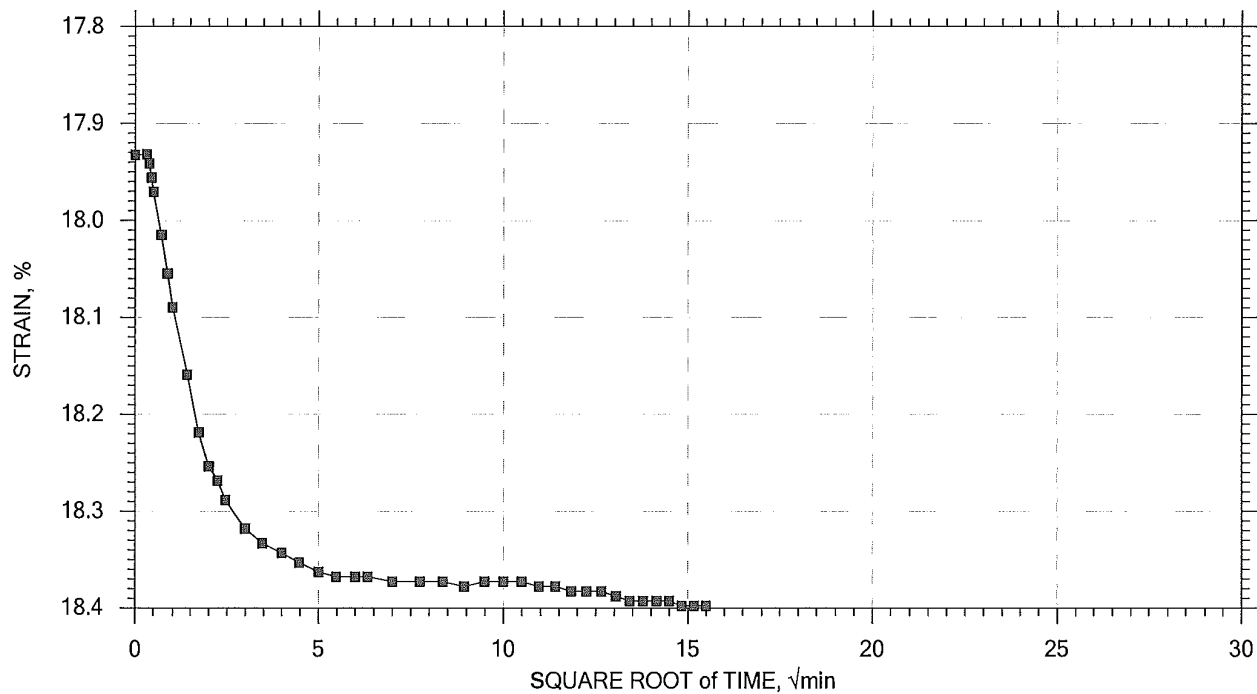
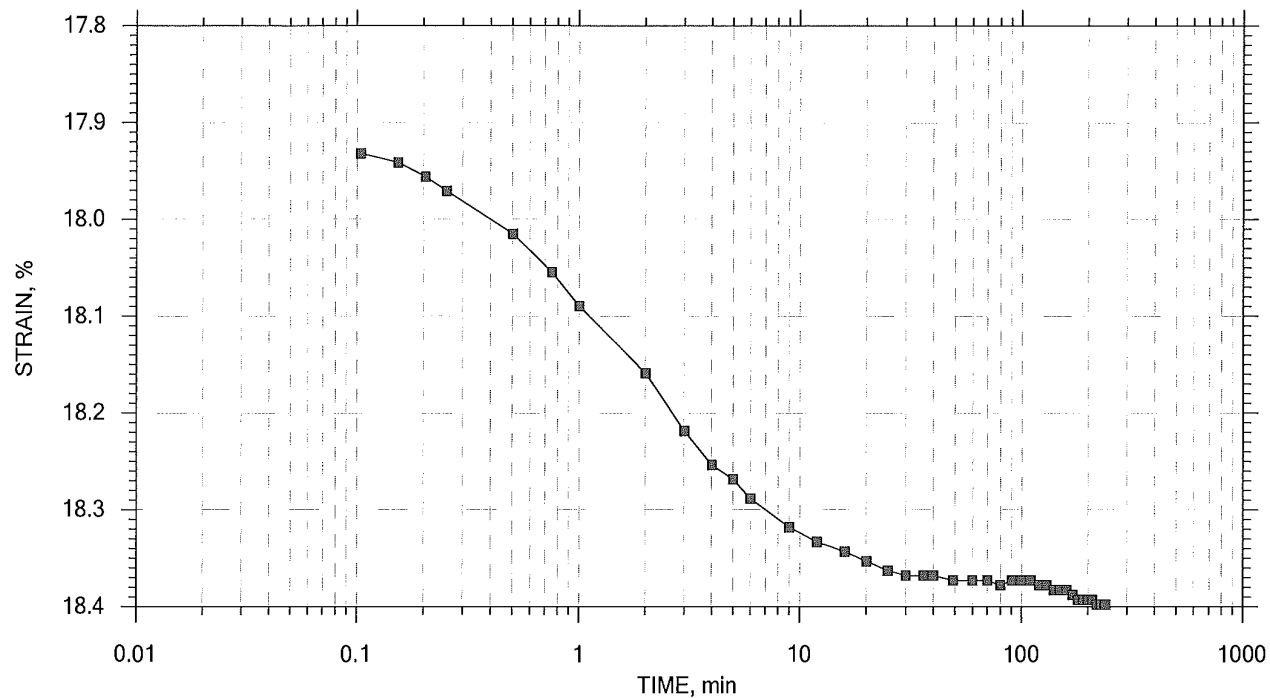
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 14

Stress: 12 tsf



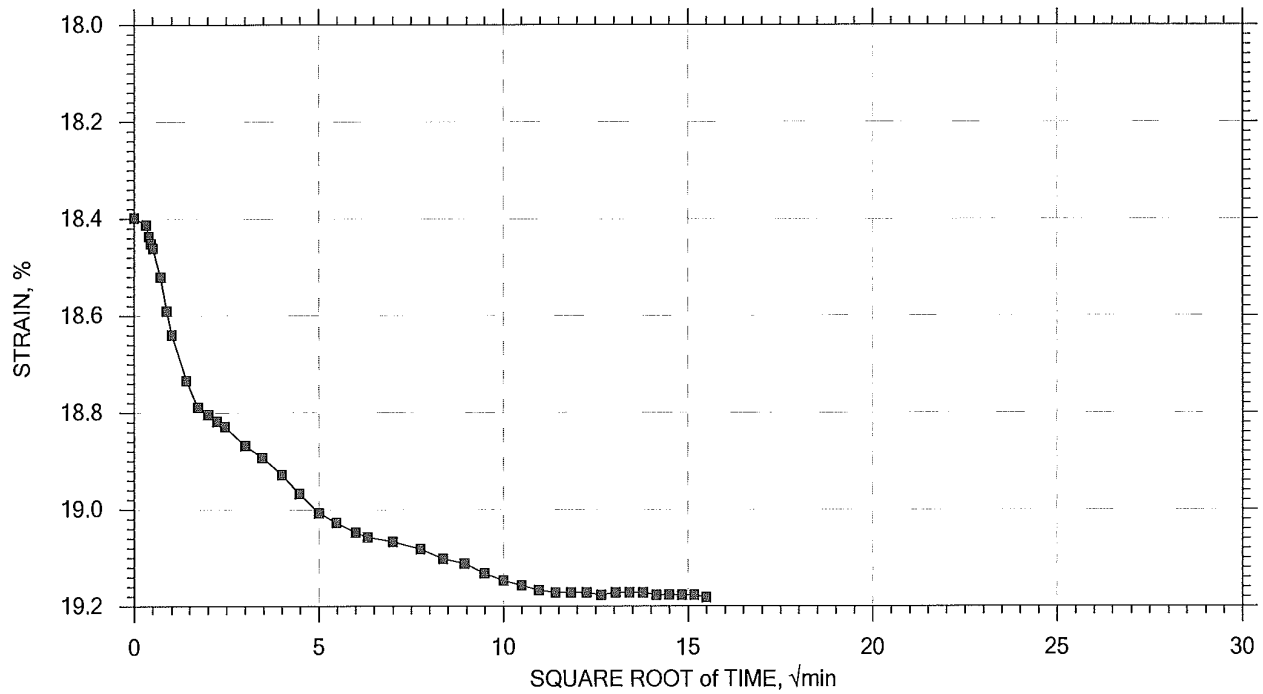
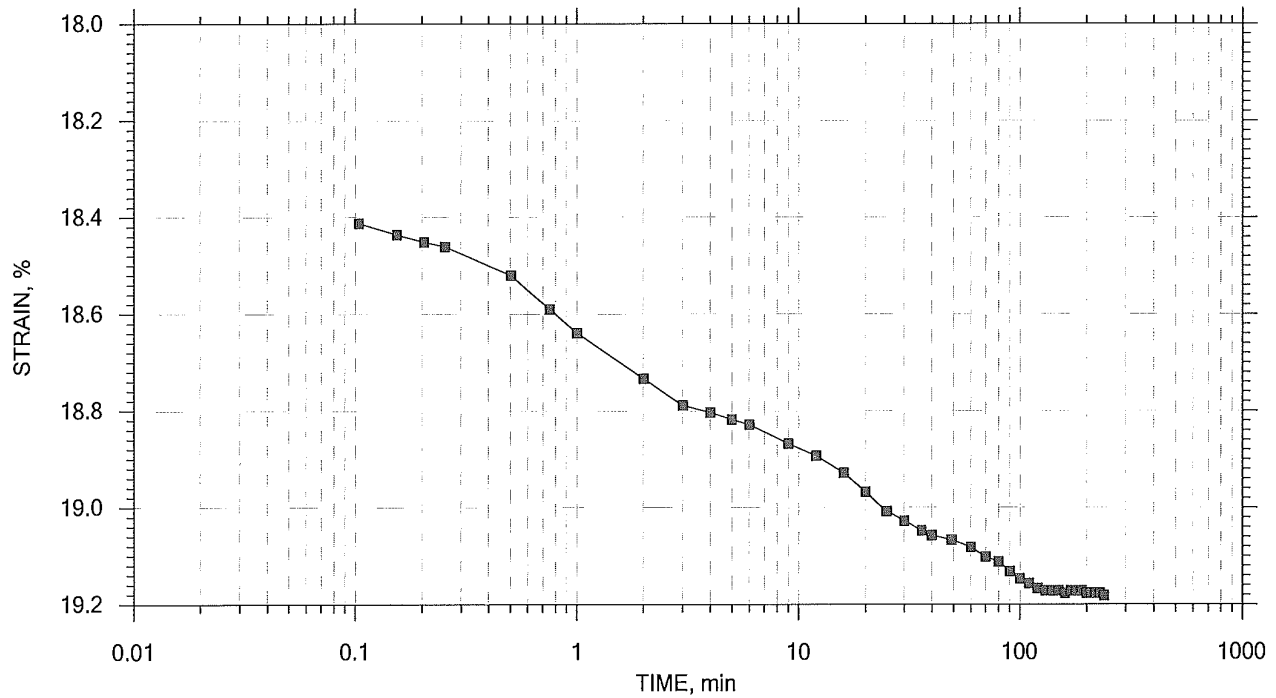
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 14

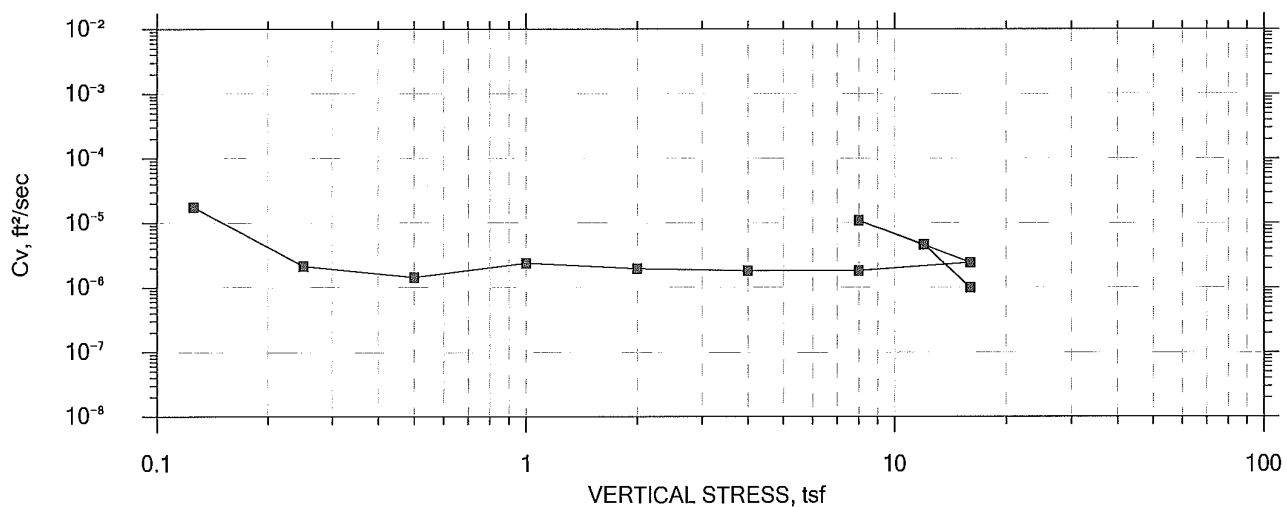
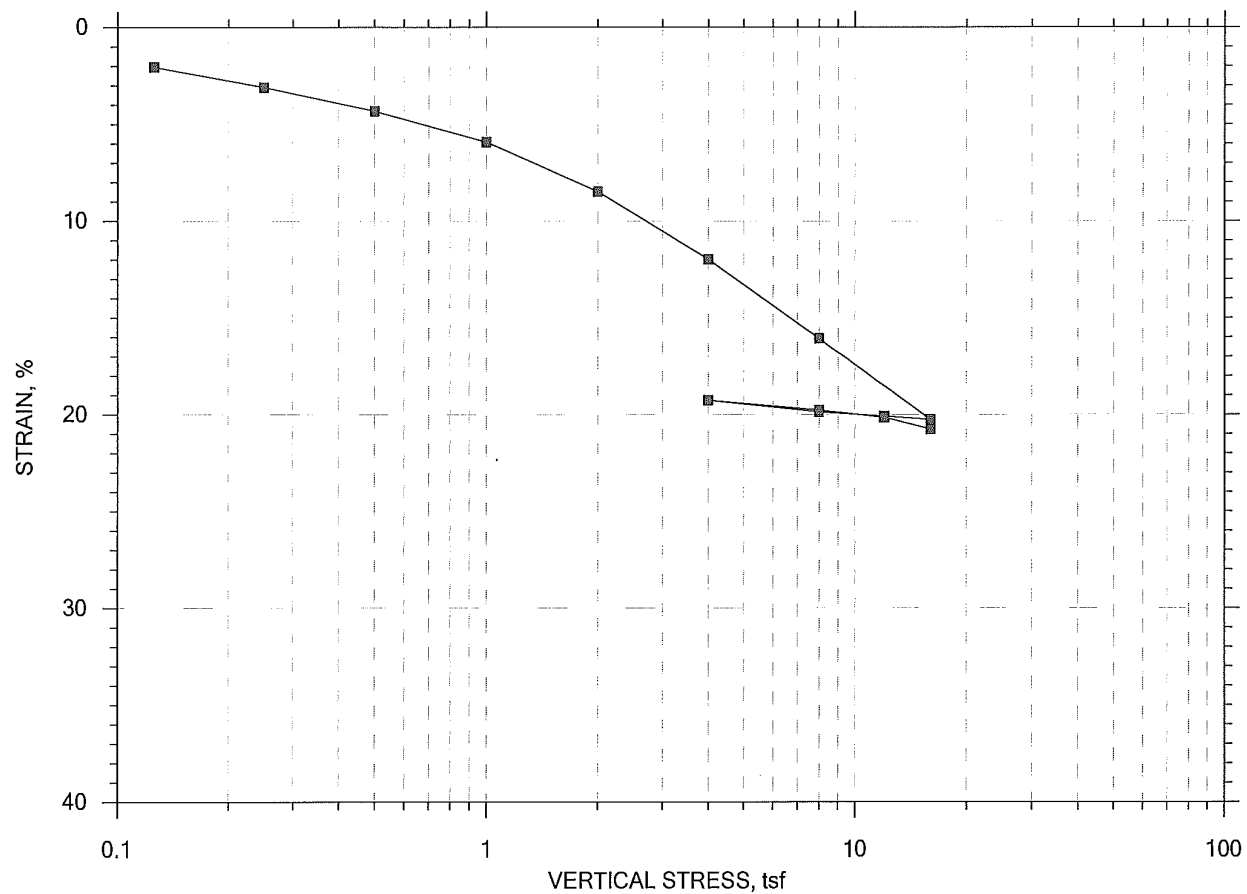
Stress: 16 tsf




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 12/19/13	Test No.: IP-1
	Depth: 24-26 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Q		

One-Dimensional Consolidation by ASTM D2435 - Method B

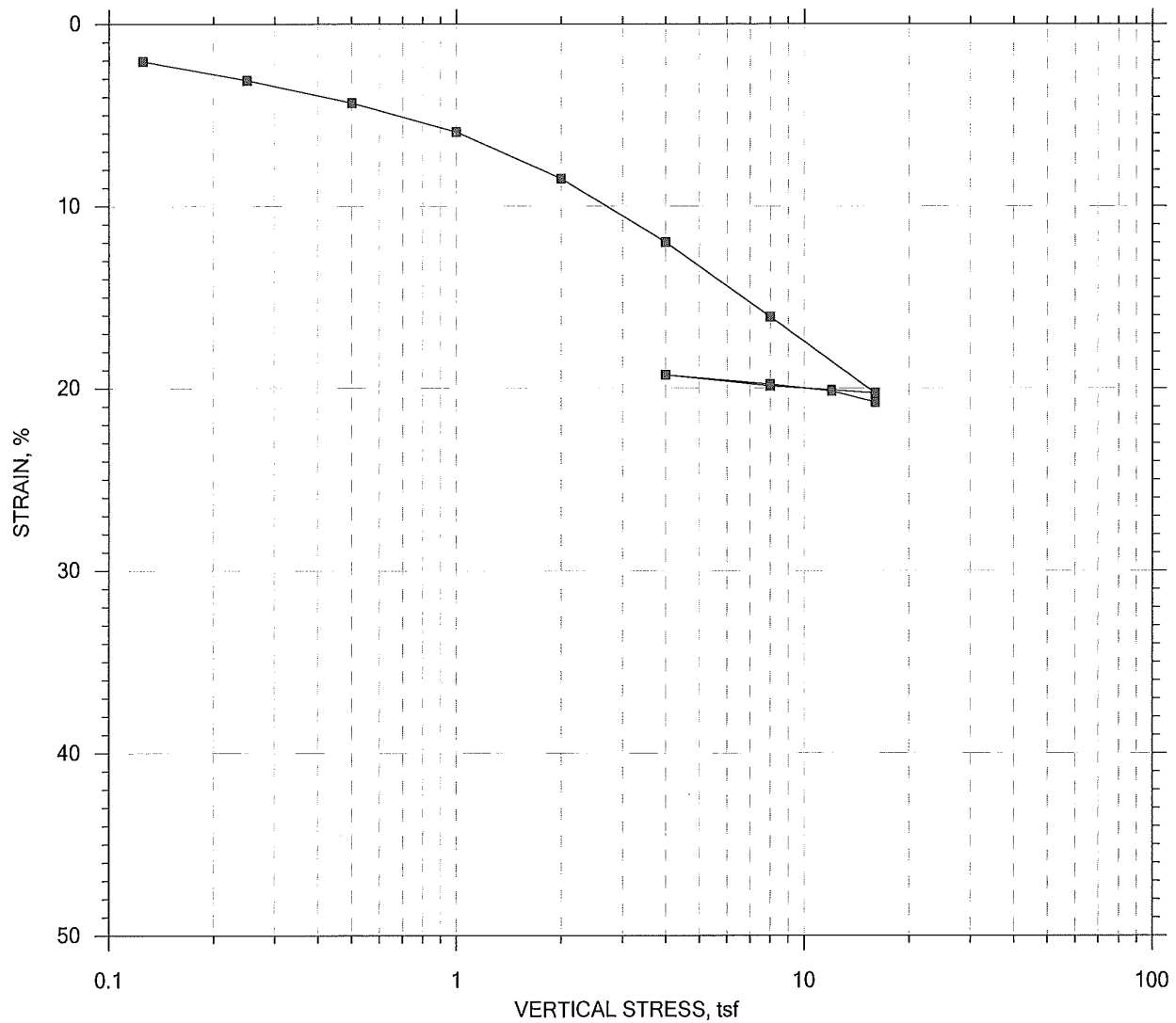
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test	
Current Vertical Effective Stress: ---			Water Content, %	37.31	23.80	
Preconsolidation Stress: ---			Dry Unit Weight, pcf	85.056	105.01	
Compression Ratio: ---			Saturation, %	98.86	100.00	
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.06	0.67
LL: ---	PL: ---	PI: ---	GS: 2.80			

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 -- Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-3
Test No.: IP-4

Location: Chelsea, MA
Tested By: md
Test Date: 12/20/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 34-36 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System Y

Estimated Specific Gravity: 2.80
Initial Void Ratio: 1.06
Final Void Ratio: 0.668

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.81 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	13446	RING		13310
Wt. Container + Wet Soil, gm	333.34	263.00	248.19	144.65
Wt. Container + Dry Soil, gm	242.94	222.11	222.11	118.44
Wt. Container, gm	8.2800	112.51	112.51	8.3100
Wt. Dry Soil, gm	234.66	109.60	109.60	110.13
Water Content, %	38.52	37.31	23.80	23.80
Void Ratio	---	1.06	0.668	---
Degree of Saturation, %	---	98.86	100.00	---
Dry Unit Weight, pcf	---	85.056	105.01	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-3
Test No.: IP-4

Location: Chelsea, MA
Tested By: md
Test Date: 12/20/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 34-36 ft
Elevation: ----

Soil Description: Moist, greenish gray clay
Remarks: System Y

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.125	0.02035	1.02	2.03	1.838	1.31e-005	1.63e-001	5.74e-003	
2	0.250	0.03087	0.995	3.09	11.628	2.00e-006	8.42e-002	4.55e-004	
3	0.500	0.04325	0.970	4.32	11.177	2.04e-006	4.95e-002	2.72e-004	
4	1.00	0.05910	0.937	5.91	10.637	2.08e-006	3.17e-002	1.78e-004	
5	2.00	0.08482	0.884	8.48	10.719	1.97e-006	2.57e-002	1.37e-004	
6	4.00	0.1198	0.812	12.0	9.967	1.98e-006	1.75e-002	9.37e-005	
7	8.00	0.1607	0.728	16.1	10.088	1.80e-006	1.02e-002	4.95e-005	
8	16.0	0.2025	0.642	20.3	5.705	2.88e-006	5.24e-003	4.07e-005	
9	12.0	0.2009	0.645	20.1	0.769	2.03e-005	4.20e-004	2.30e-005	
10	8.00	0.1987	0.650	19.9	0.843	1.86e-005	5.49e-004	2.76e-005	
11	4.00	0.1926	0.662	19.3	2.841	5.59e-006	1.52e-003	2.28e-005	
12	8.00	0.1977	0.652	19.8	2.079	7.65e-006	1.27e-003	2.63e-005	
13	12.0	0.2015	0.644	20.2	4.999	3.14e-006	9.52e-004	8.08e-006	
14	16.0	0.2076	0.631	20.8	17.450	8.90e-007	1.51e-003	3.63e-006	

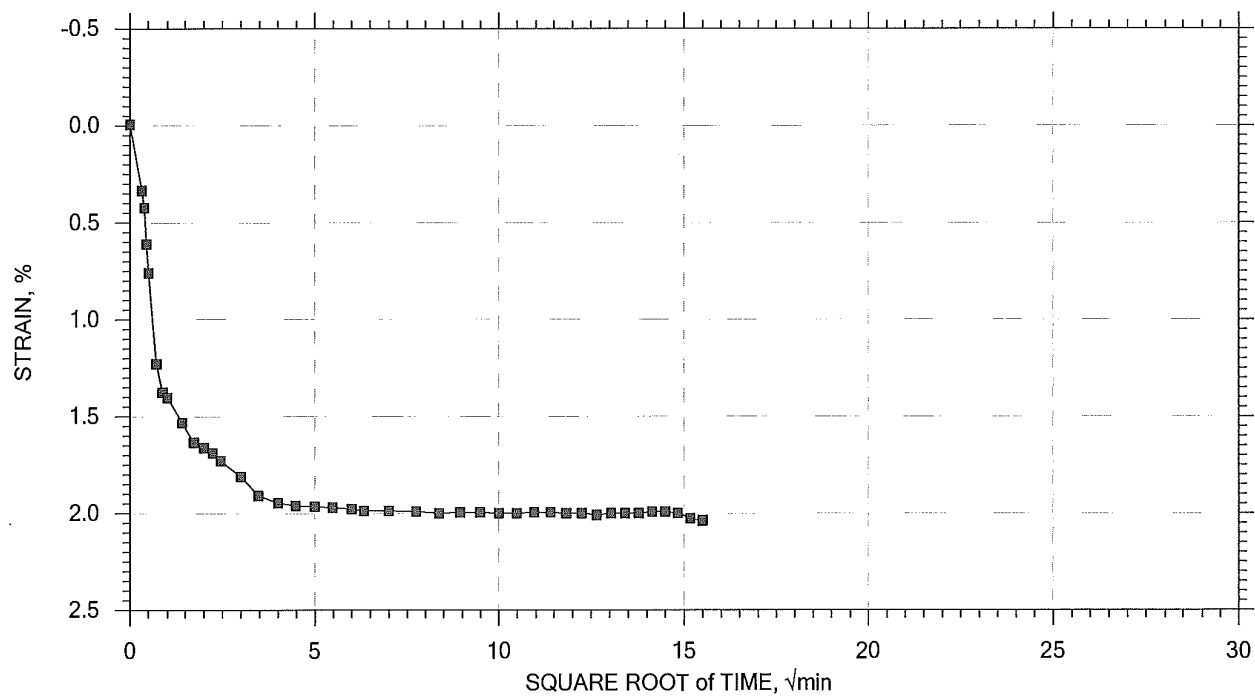
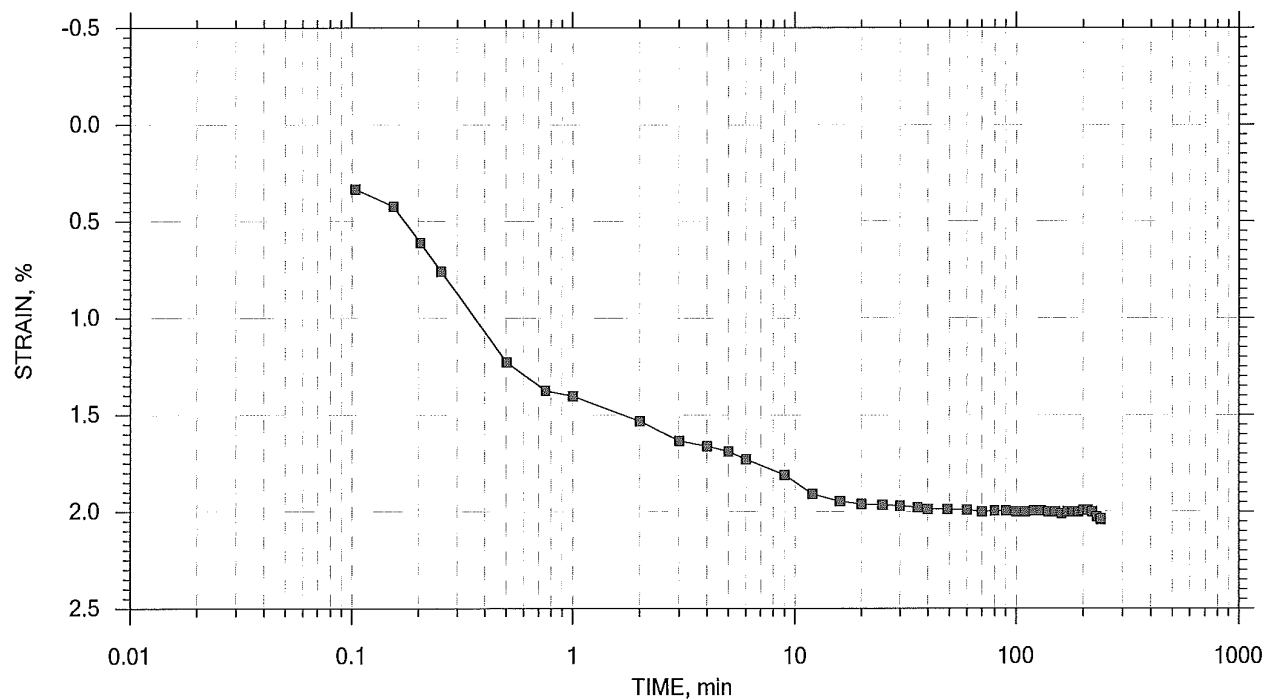
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.125	0.02035	1.02	2.03	0.000	0.00e+000	1.63e-001	0.00e+000	0.00e+000
2	0.250	0.03087	0.995	3.09	0.000	0.00e+000	8.42e-002	0.00e+000	0.00e+000
3	0.500	0.04325	0.970	4.32	4.290	1.23e-006	4.95e-002	1.64e-004	0.00e+000
4	1.00	0.05910	0.937	5.91	1.998	2.57e-006	3.17e-002	2.20e-004	0.00e+000
5	2.00	0.08482	0.884	8.48	2.396	2.05e-006	2.57e-002	1.42e-004	0.00e+000
6	4.00	0.1198	0.812	12.0	2.730	1.68e-006	1.75e-002	7.94e-005	0.00e+000
7	8.00	0.1607	0.728	16.1	2.389	1.76e-006	1.02e-002	4.85e-005	0.00e+000
8	16.0	0.2025	0.642	20.3	1.782	2.14e-006	5.24e-003	3.02e-005	0.00e+000
9	12.0	0.2009	0.645	20.1	0.000	0.00e+000	4.20e-004	0.00e+000	0.00e+000
10	8.00	0.1987	0.650	19.9	0.000	0.00e+000	5.49e-004	0.00e+000	0.00e+000
11	4.00	0.1926	0.662	19.3	0.000	0.00e+000	1.52e-003	0.00e+000	0.00e+000
12	8.00	0.1977	0.652	19.8	0.329	1.12e-005	1.27e-003	3.85e-005	0.00e+000
13	12.0	0.2015	0.644	20.2	0.000	0.00e+000	9.52e-004	0.00e+000	0.00e+000
14	16.0	0.2076	0.631	20.8	0.000	0.00e+000	1.51e-003	0.00e+000	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 14

Stress: 0.125 tsf



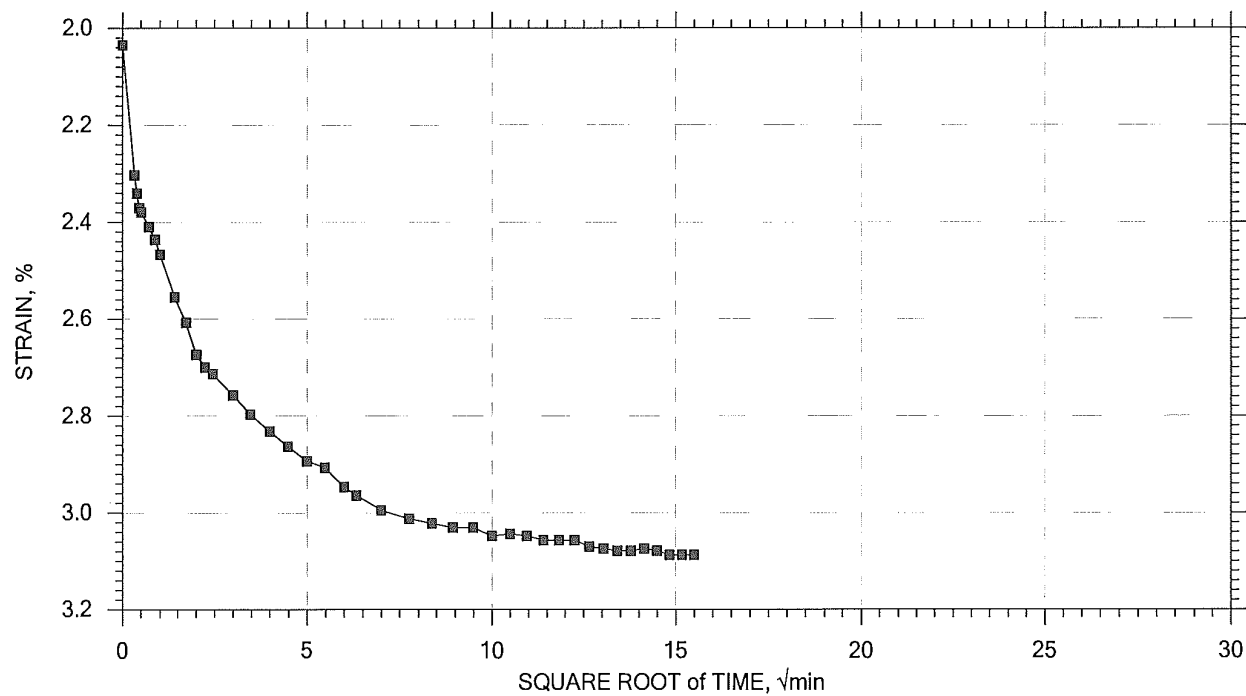
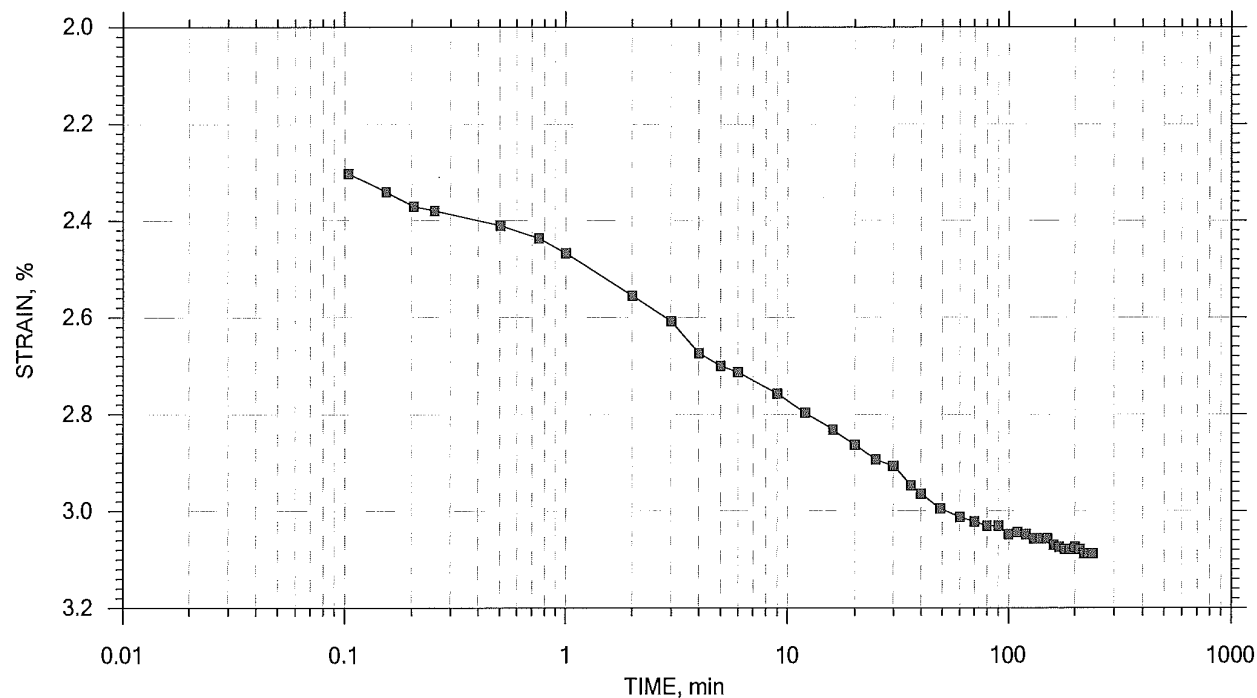
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 14

Stress: 0.25 tsf



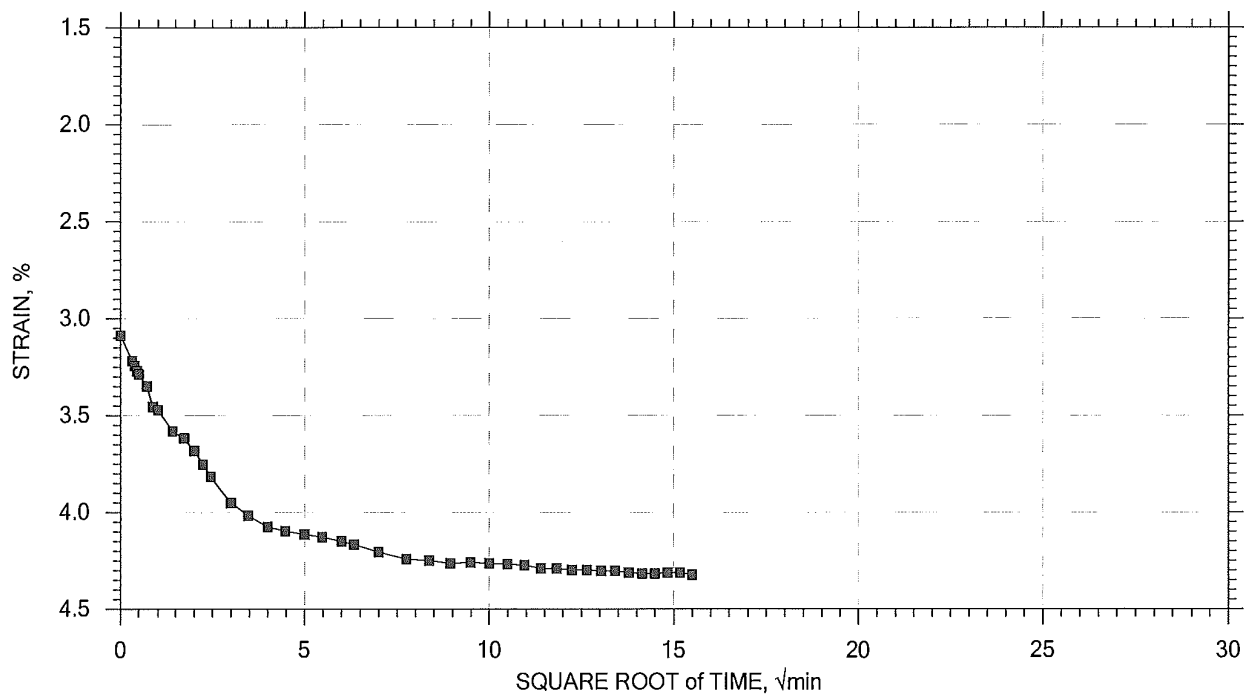
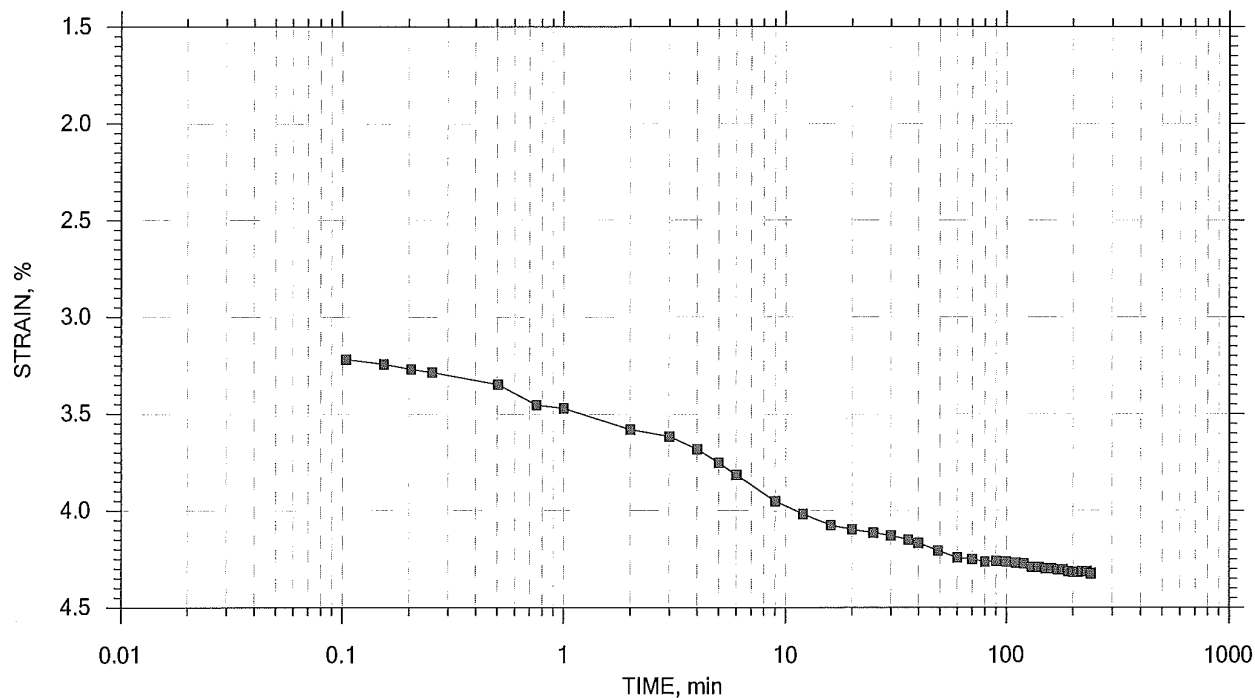
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 14

Stress: 0.5 tsf



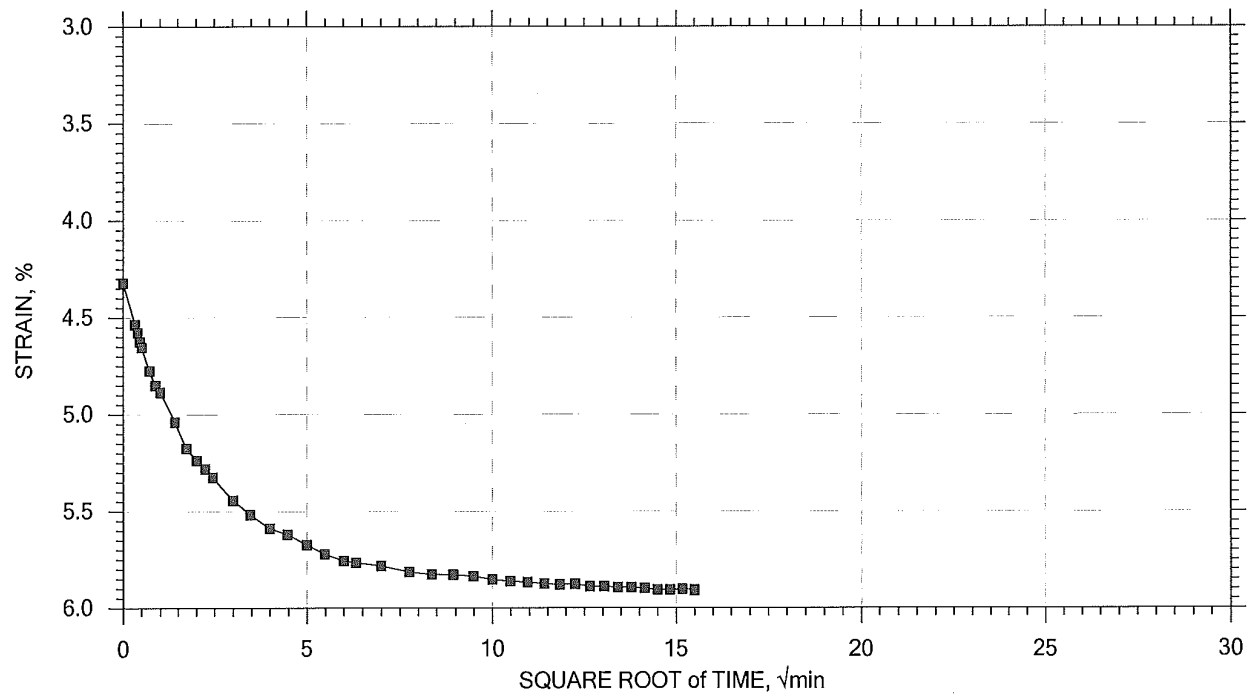
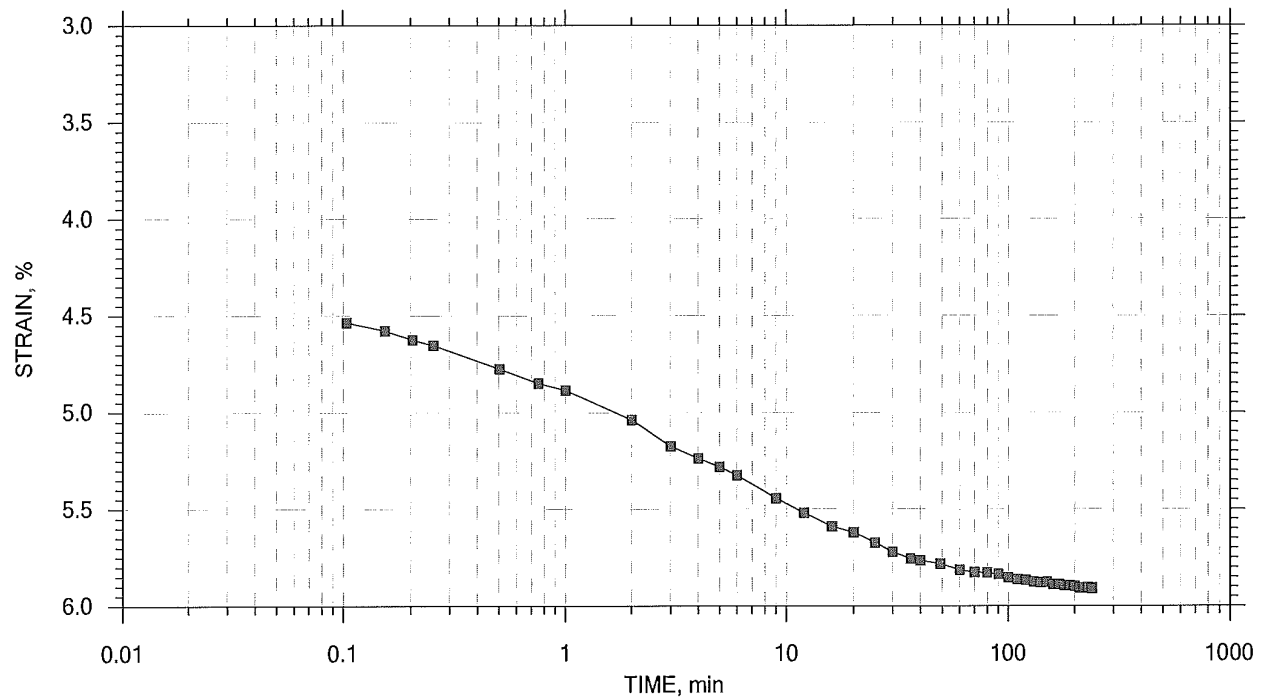
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 14

Stress: 1 tsf



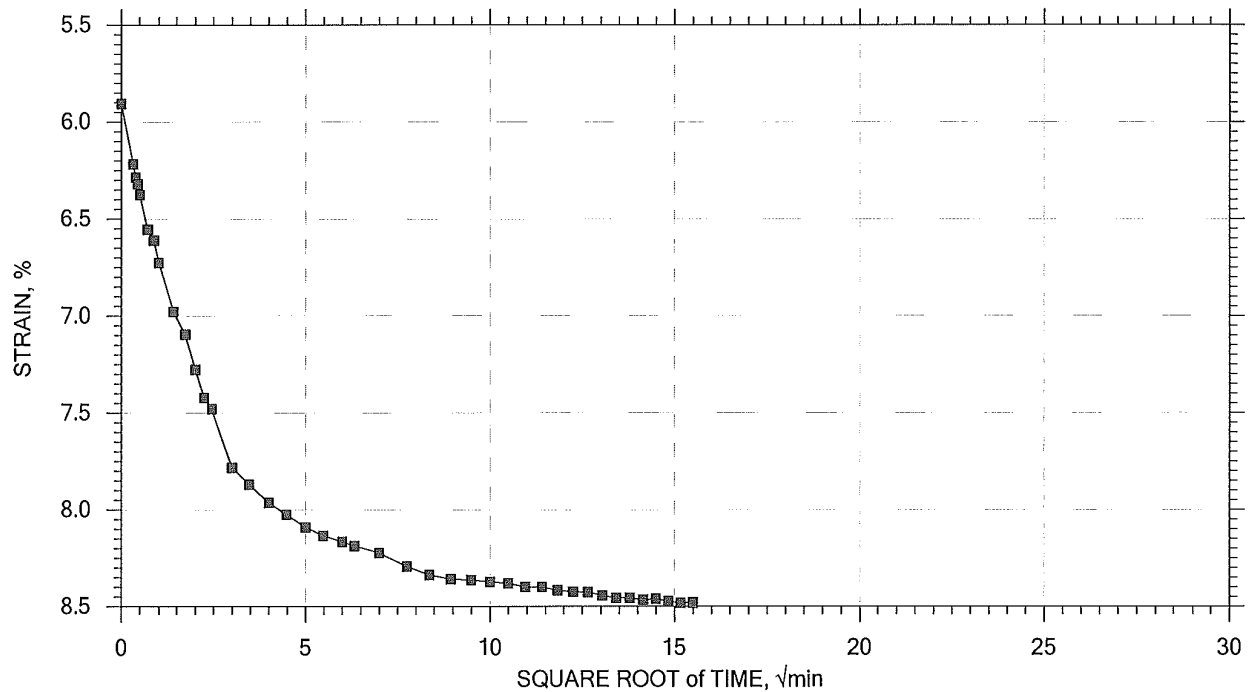
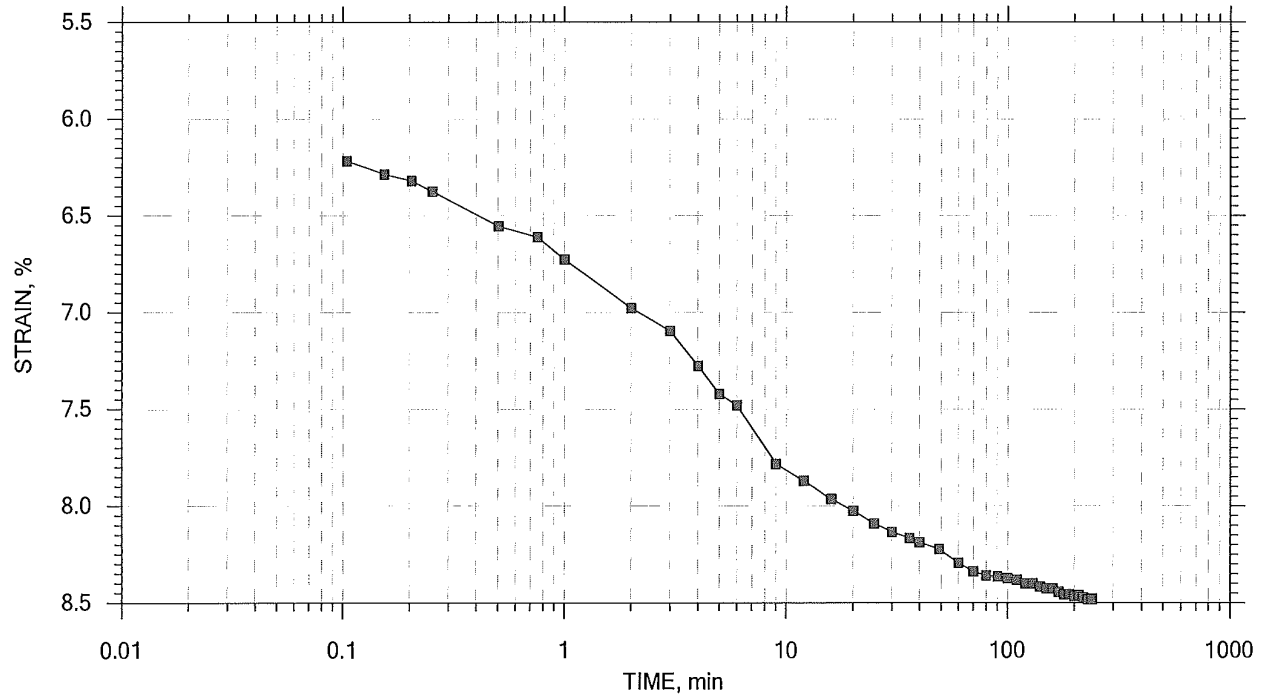
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 14

Stress: 2 tsf



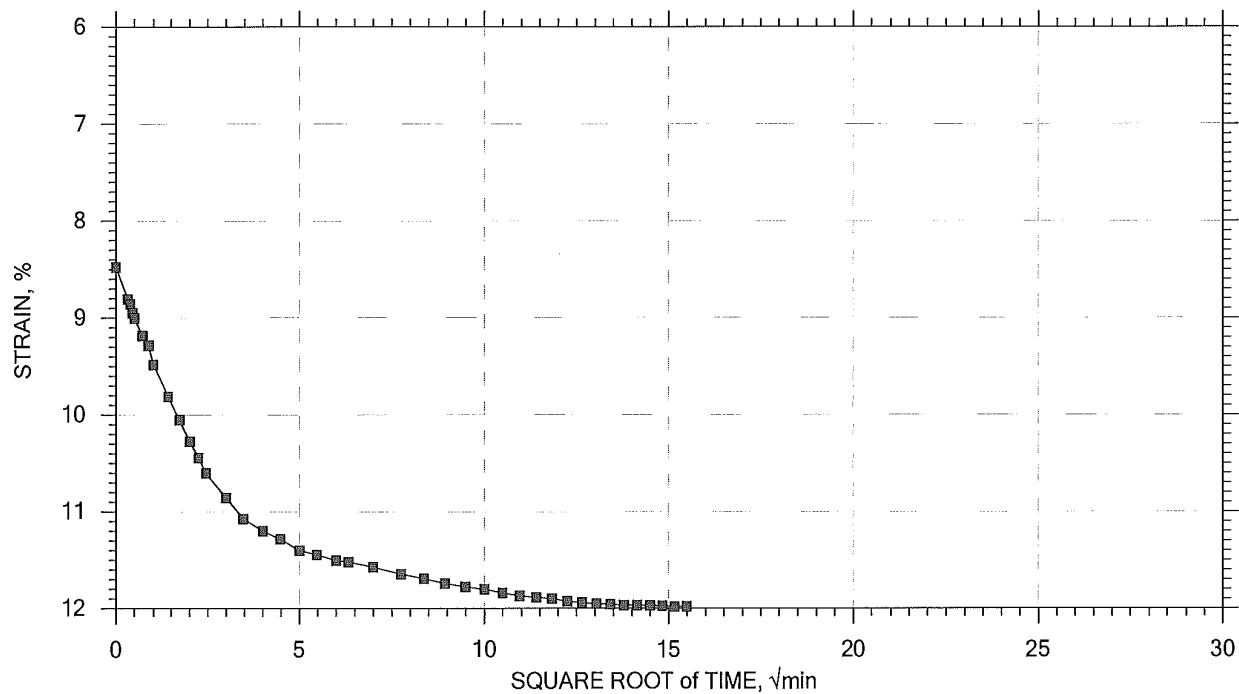
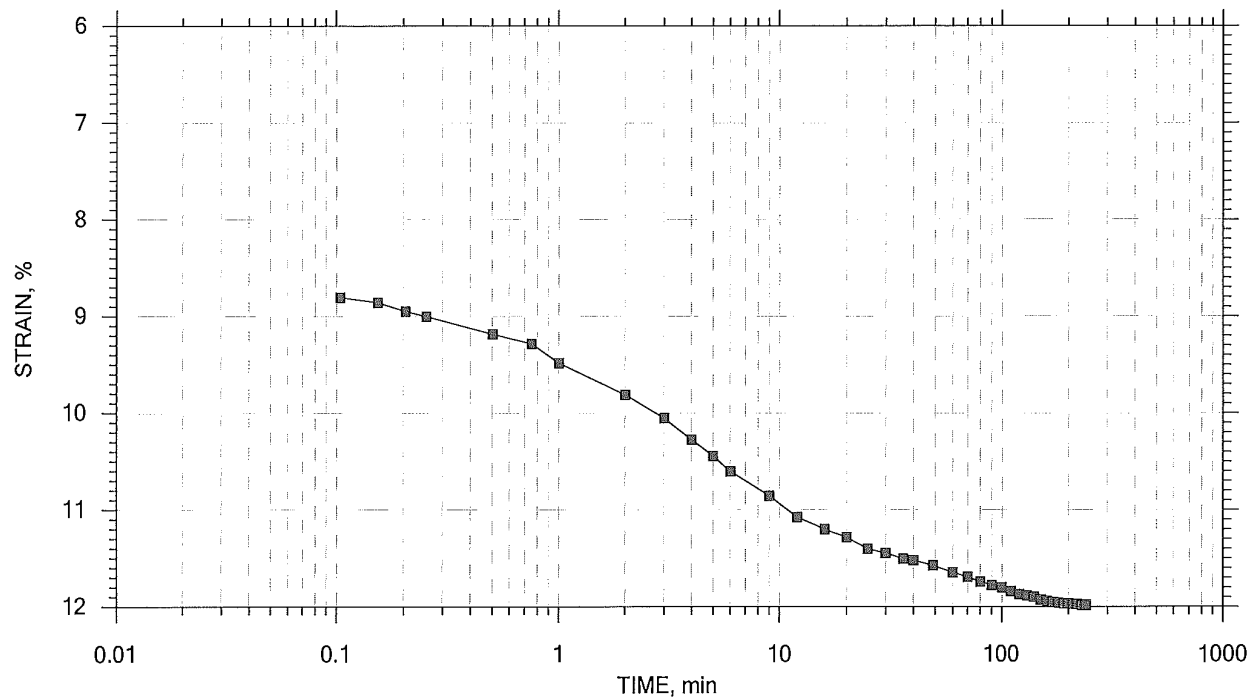
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 14

Stress: 4 tsf



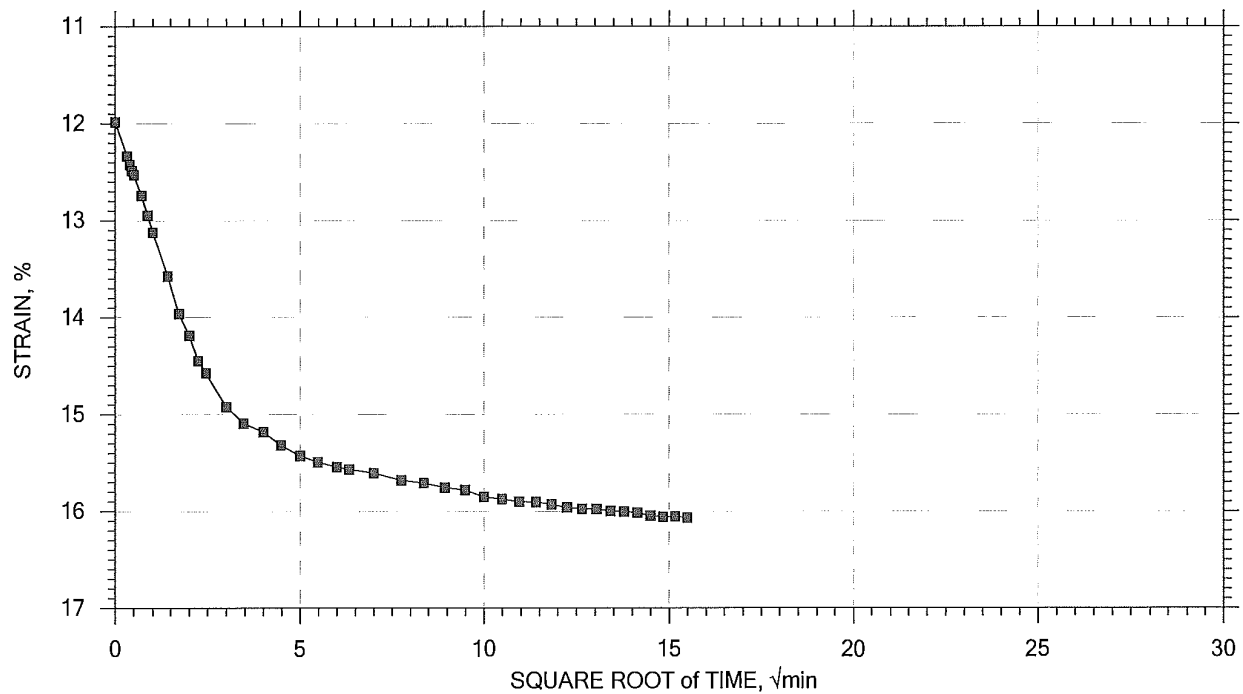
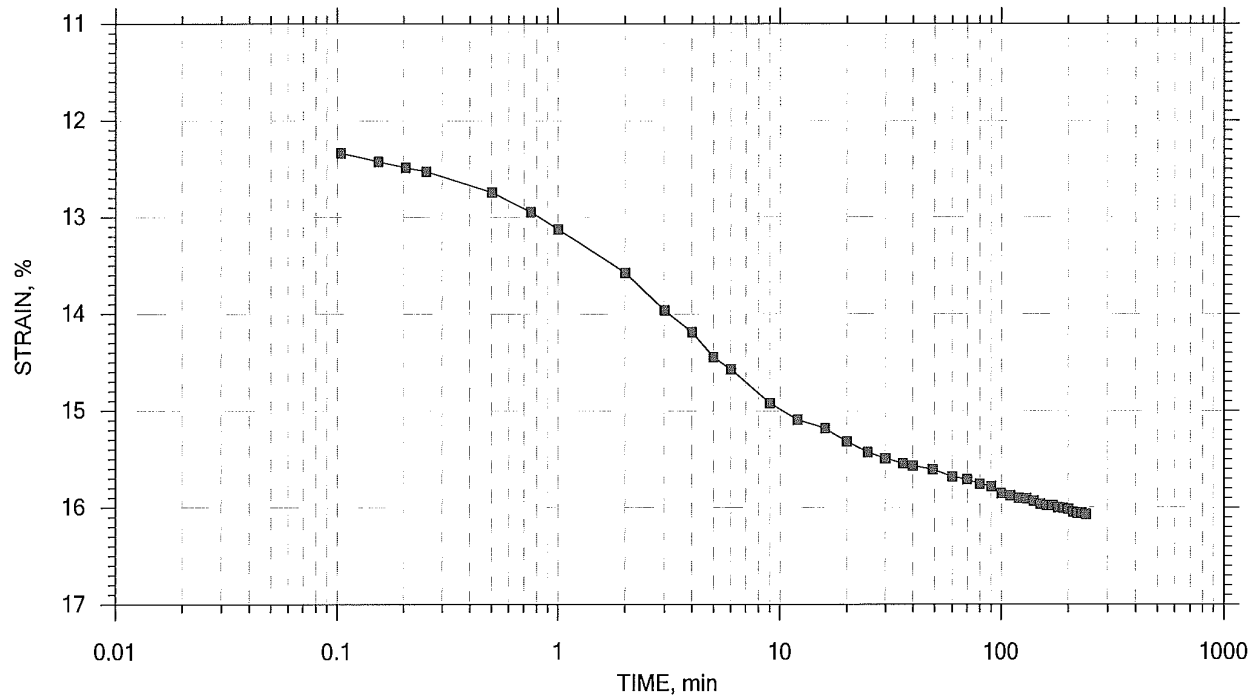
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 14

Stress: 8 tsf



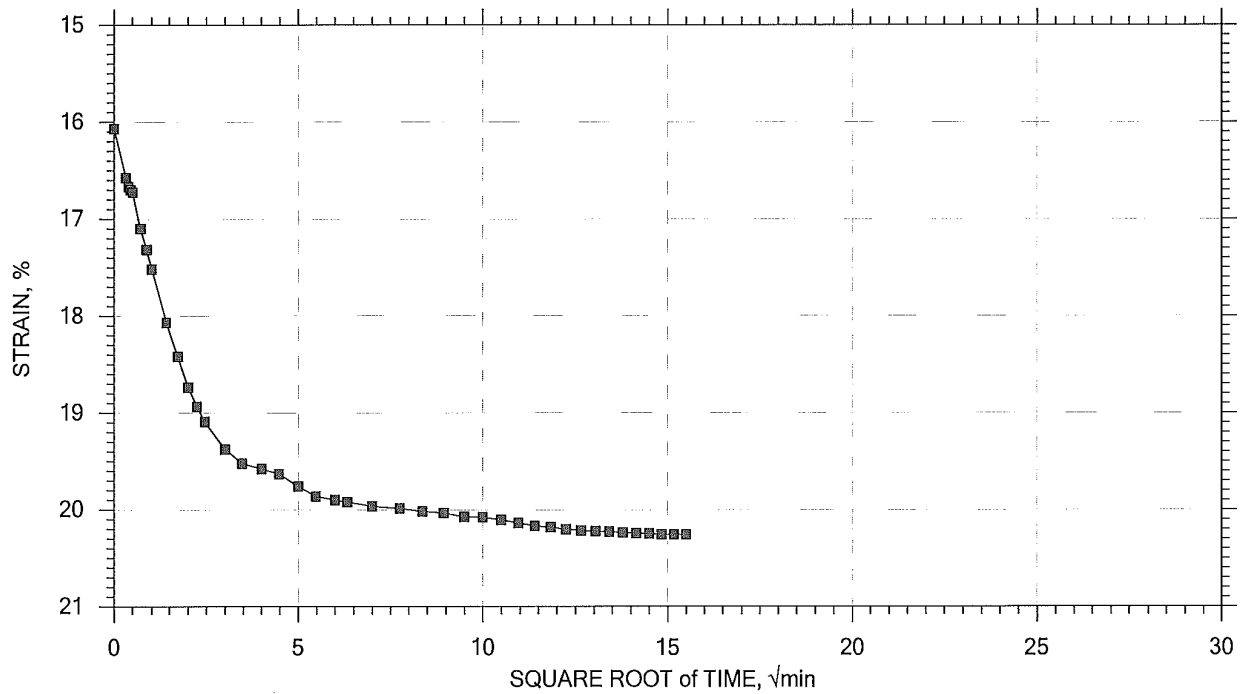
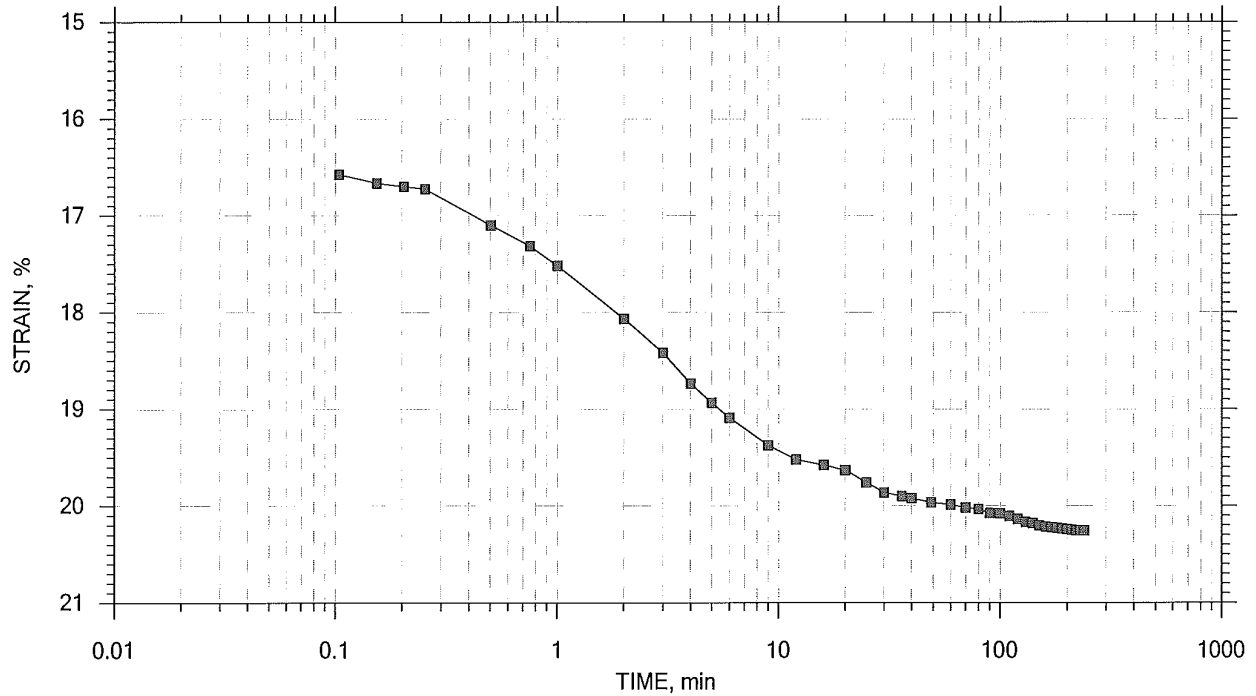
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 14

Stress: 16 tsf



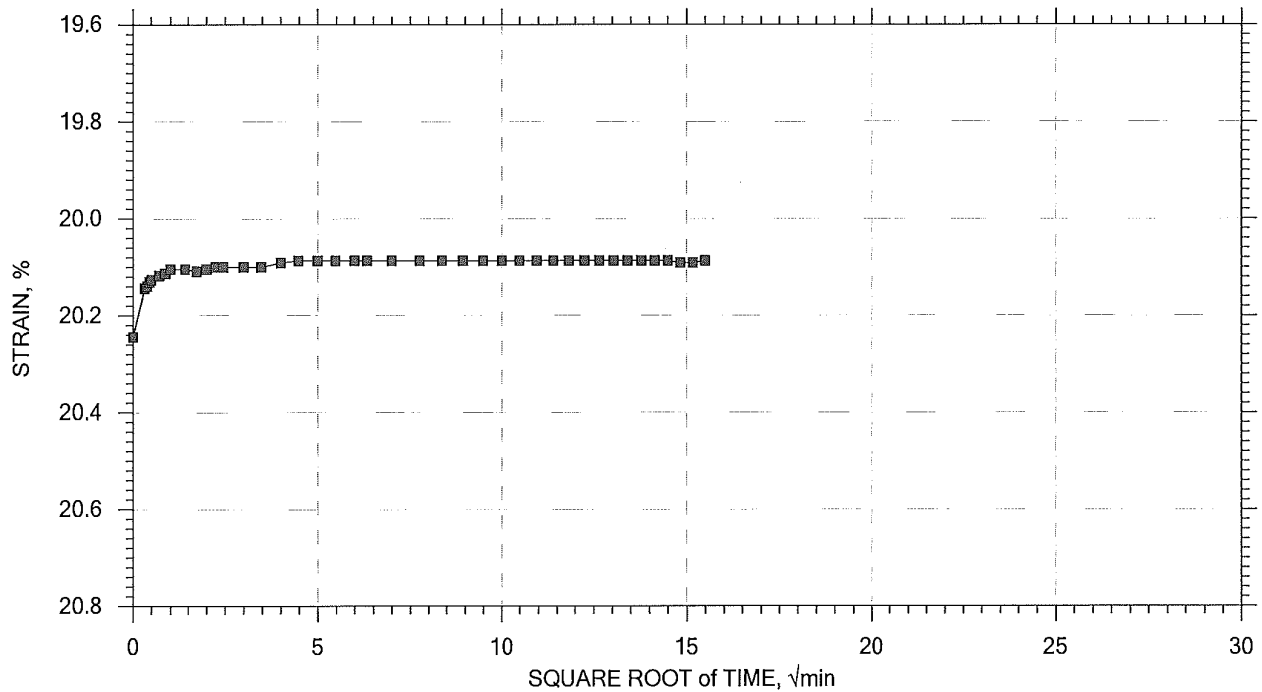
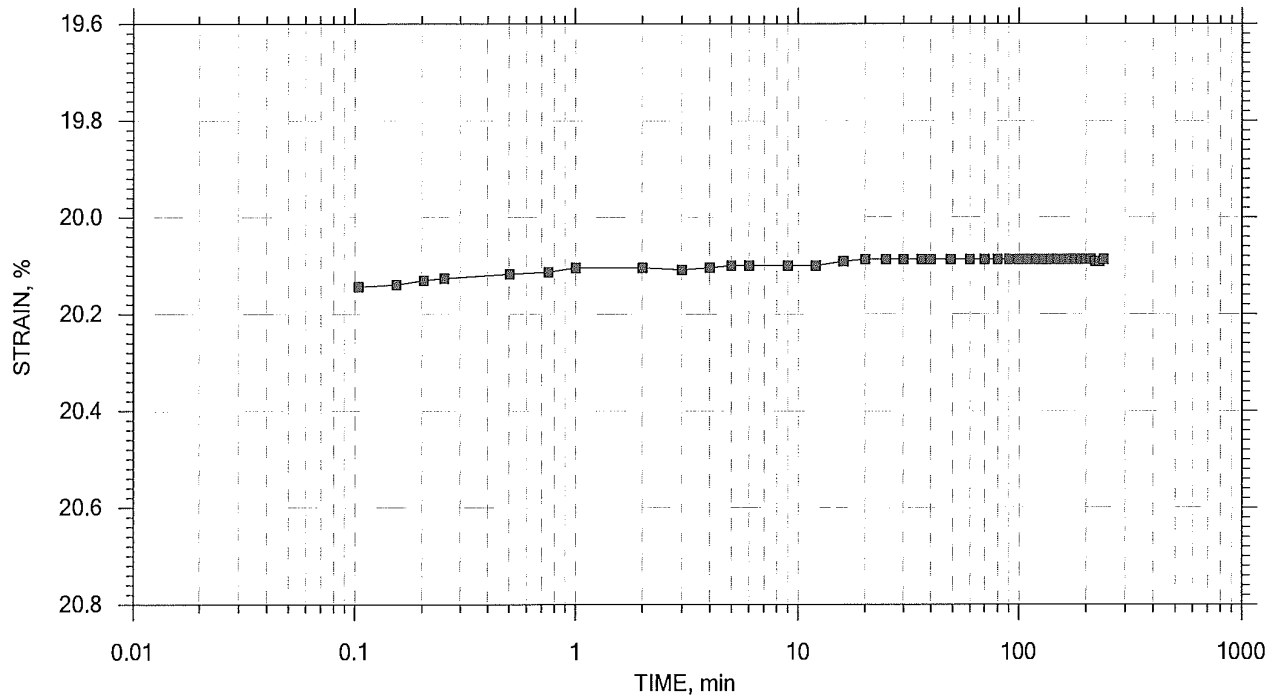
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 14

Stress: 12 tsf



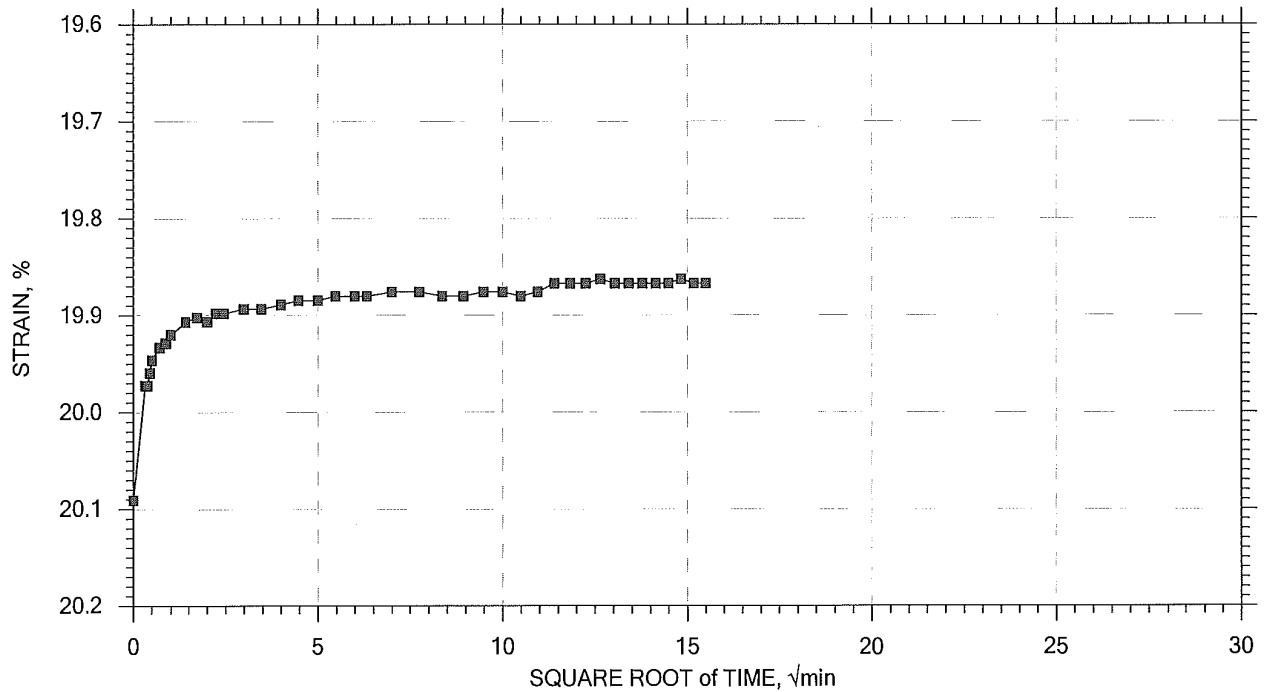
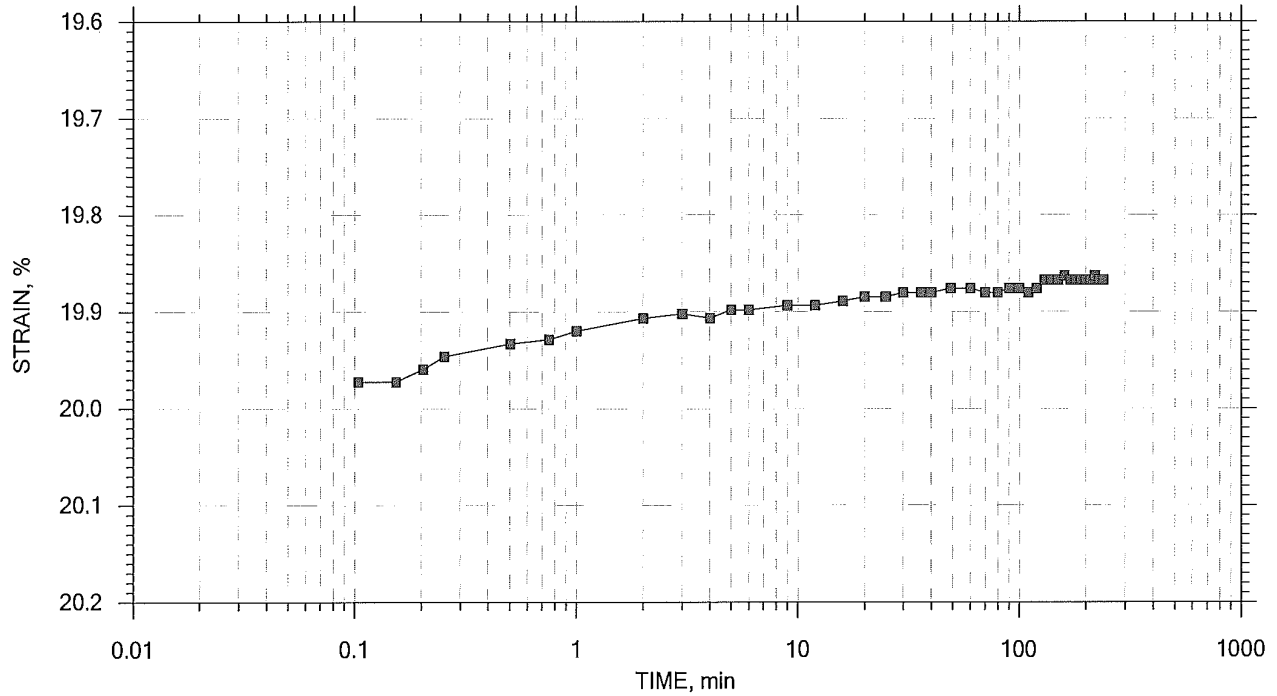
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 14

Stress: 8 tsf



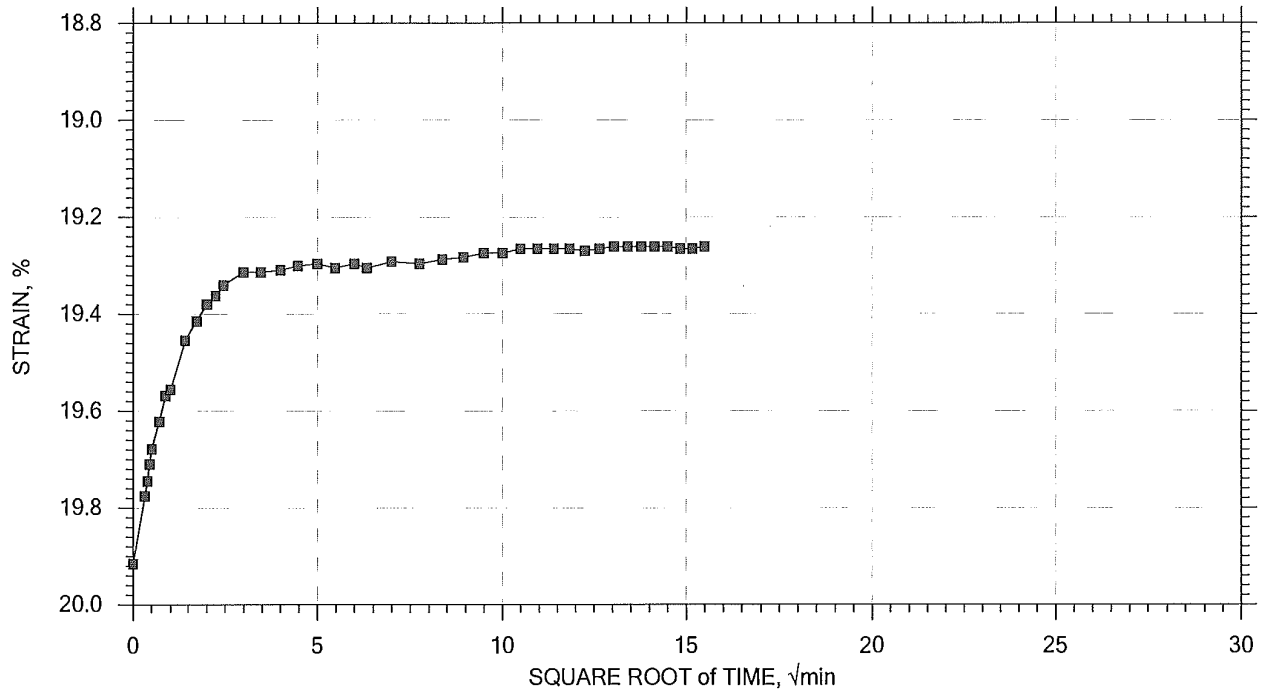
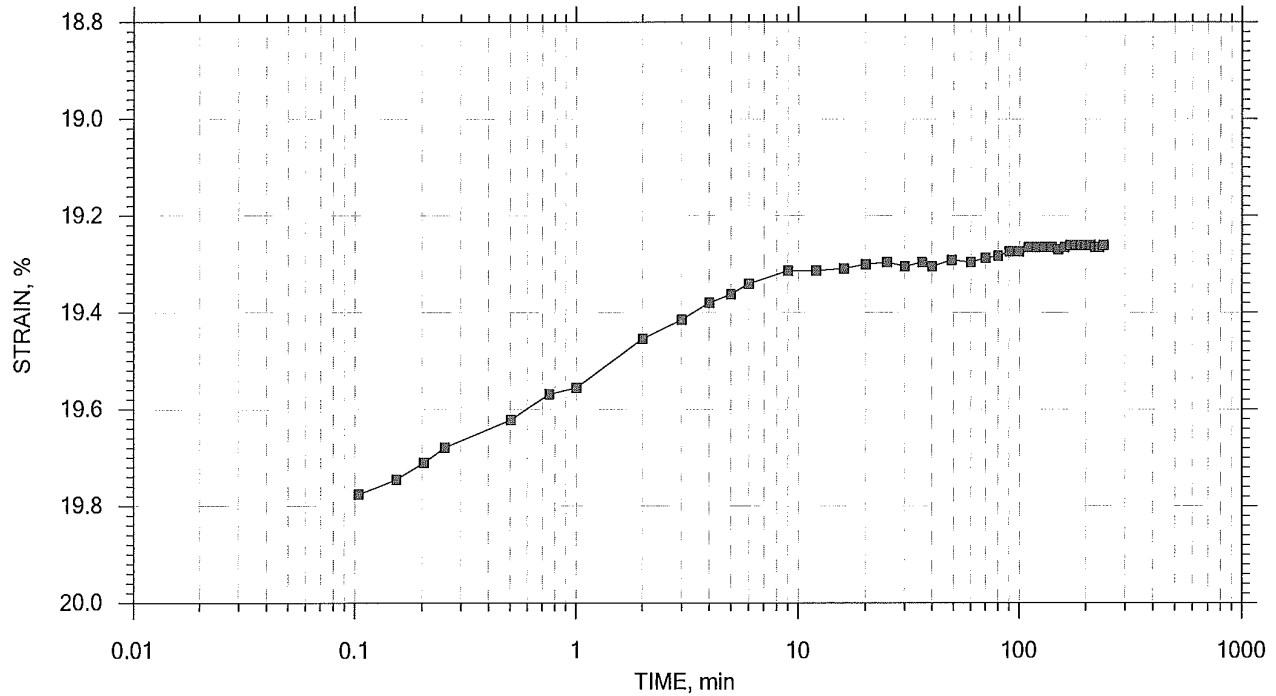
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 14

Stress: 4 tsf



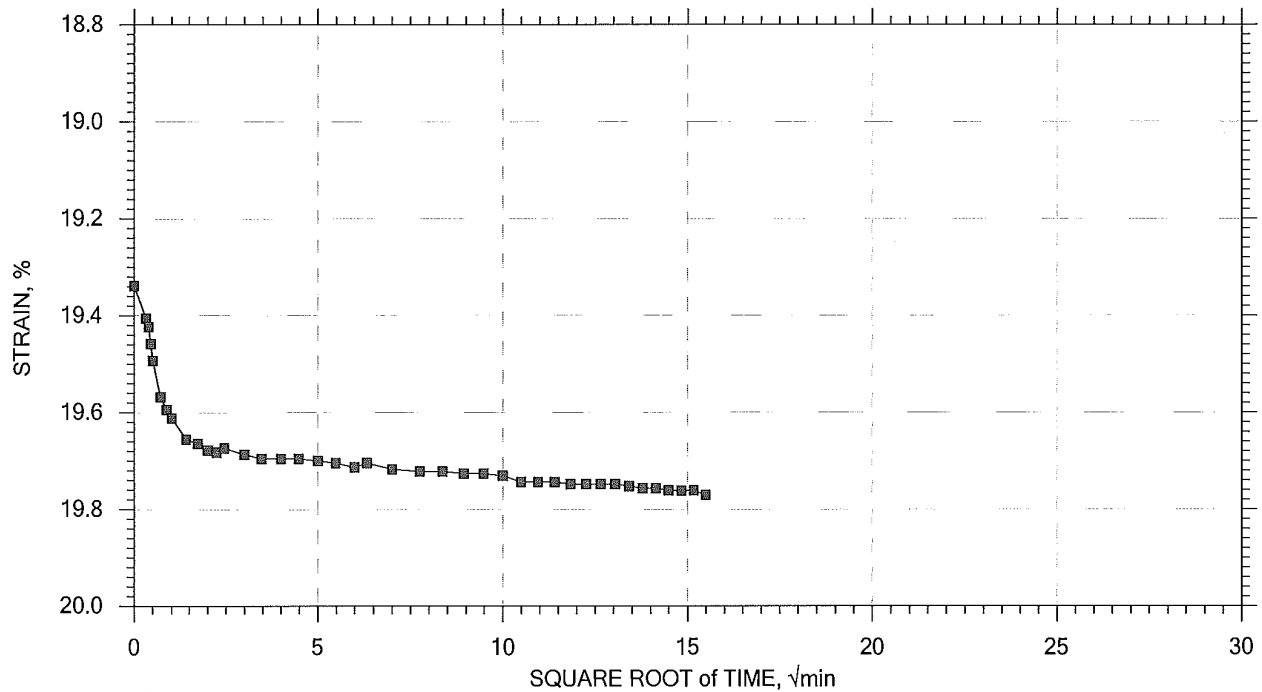
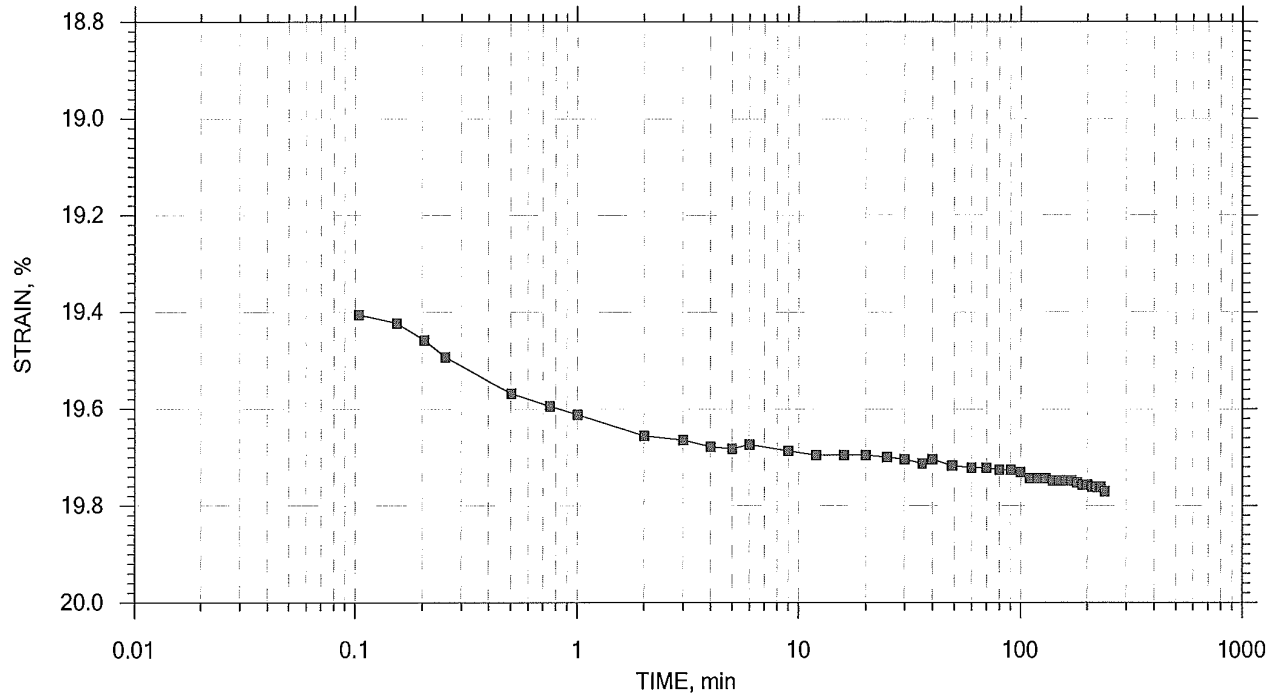
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 14

Stress: 8 tsf



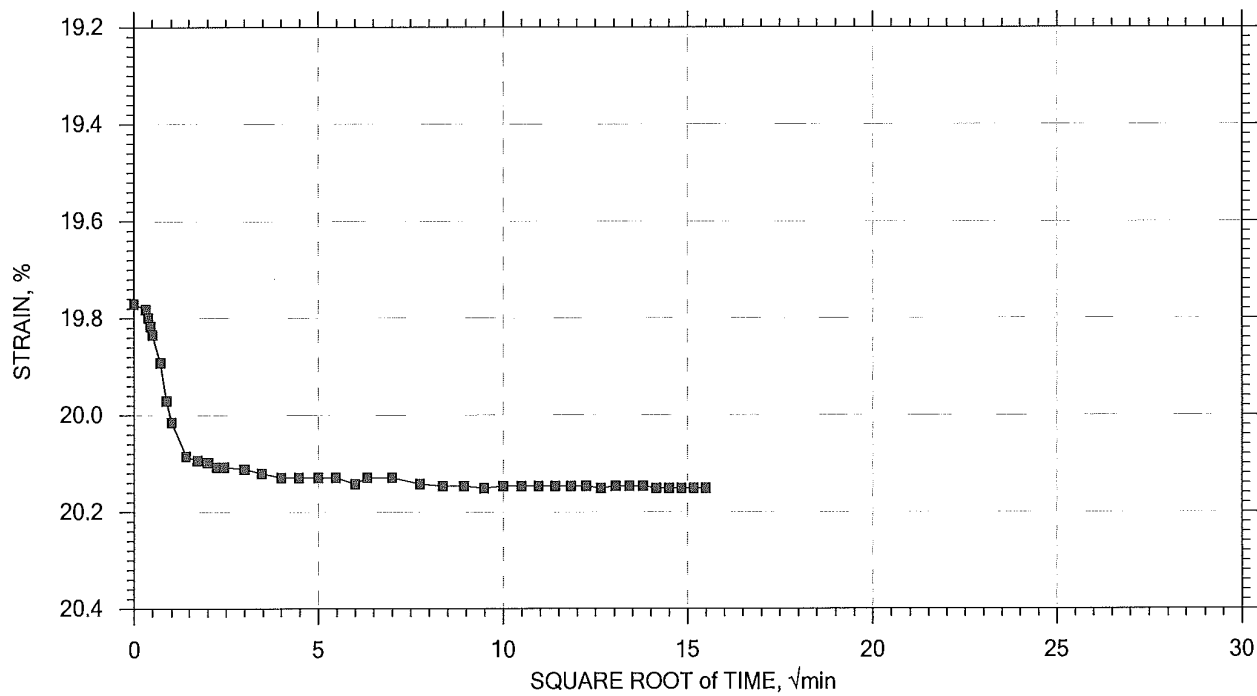
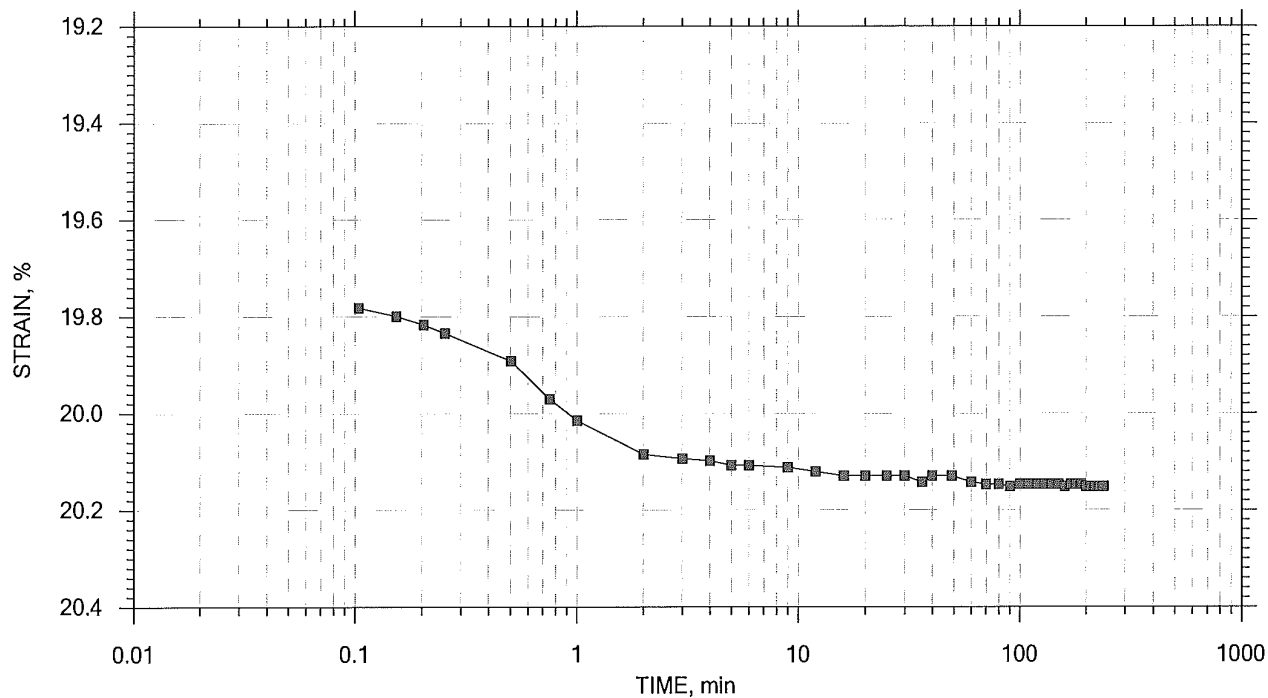
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 14

Stress: 12 tsf



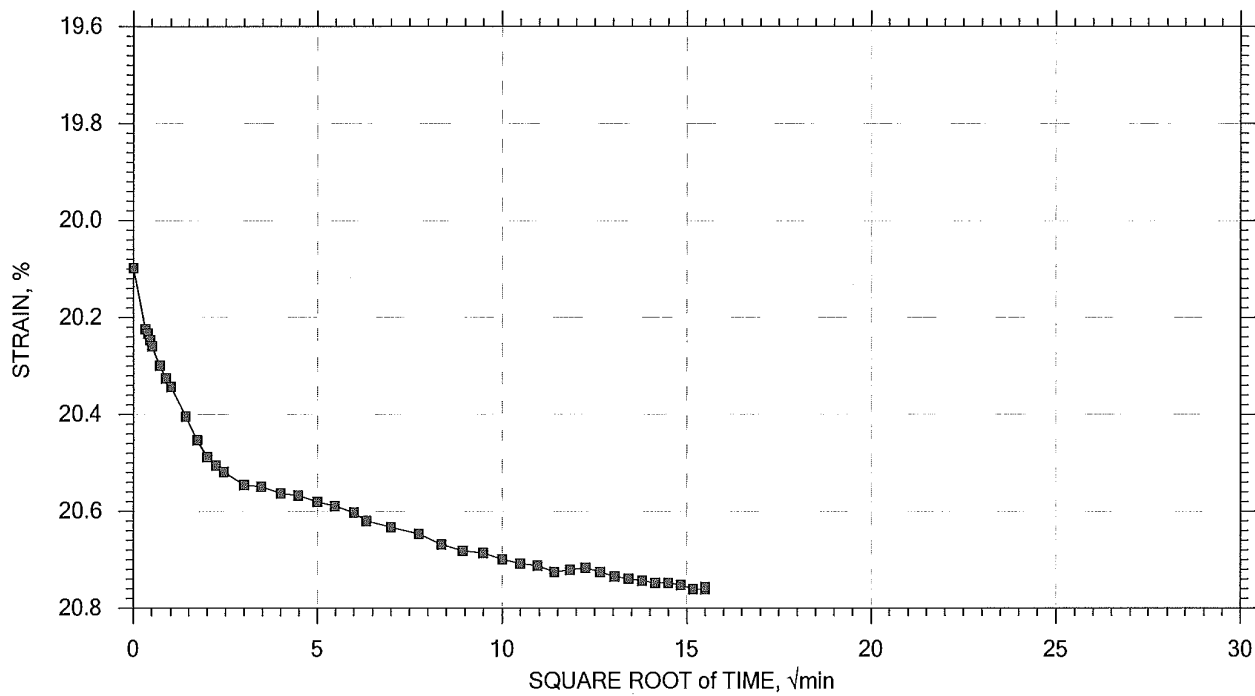
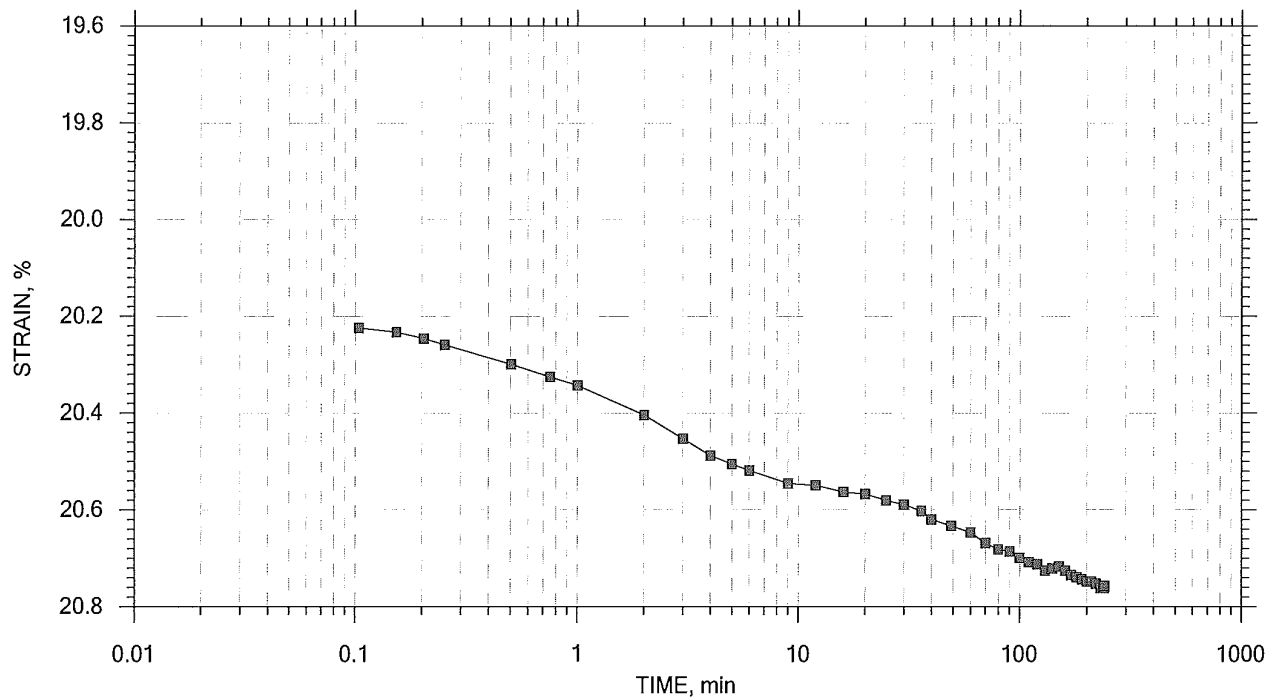
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 14

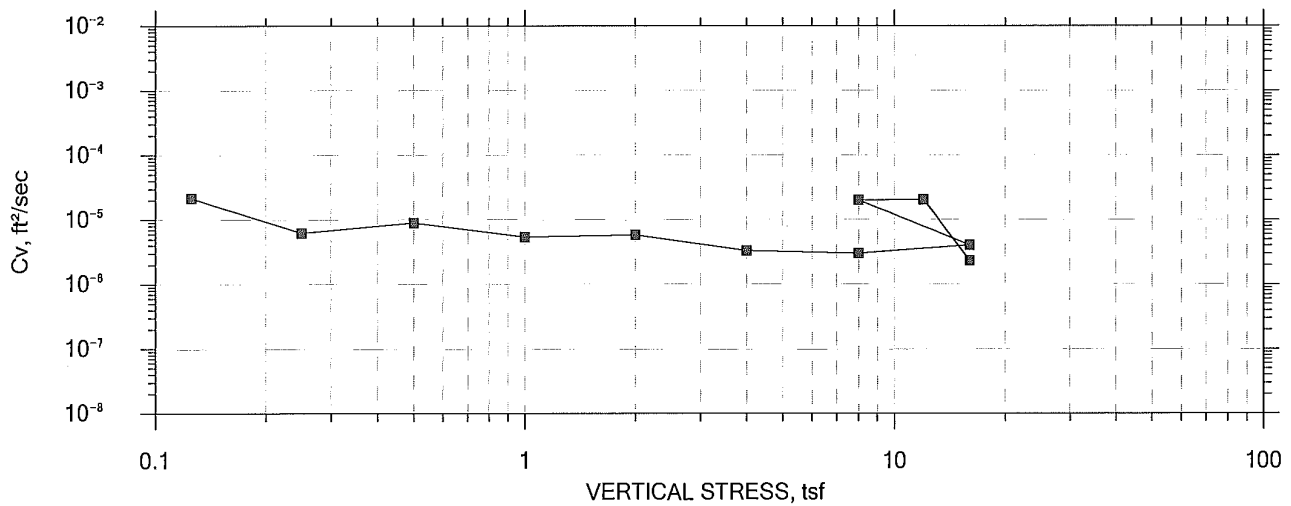
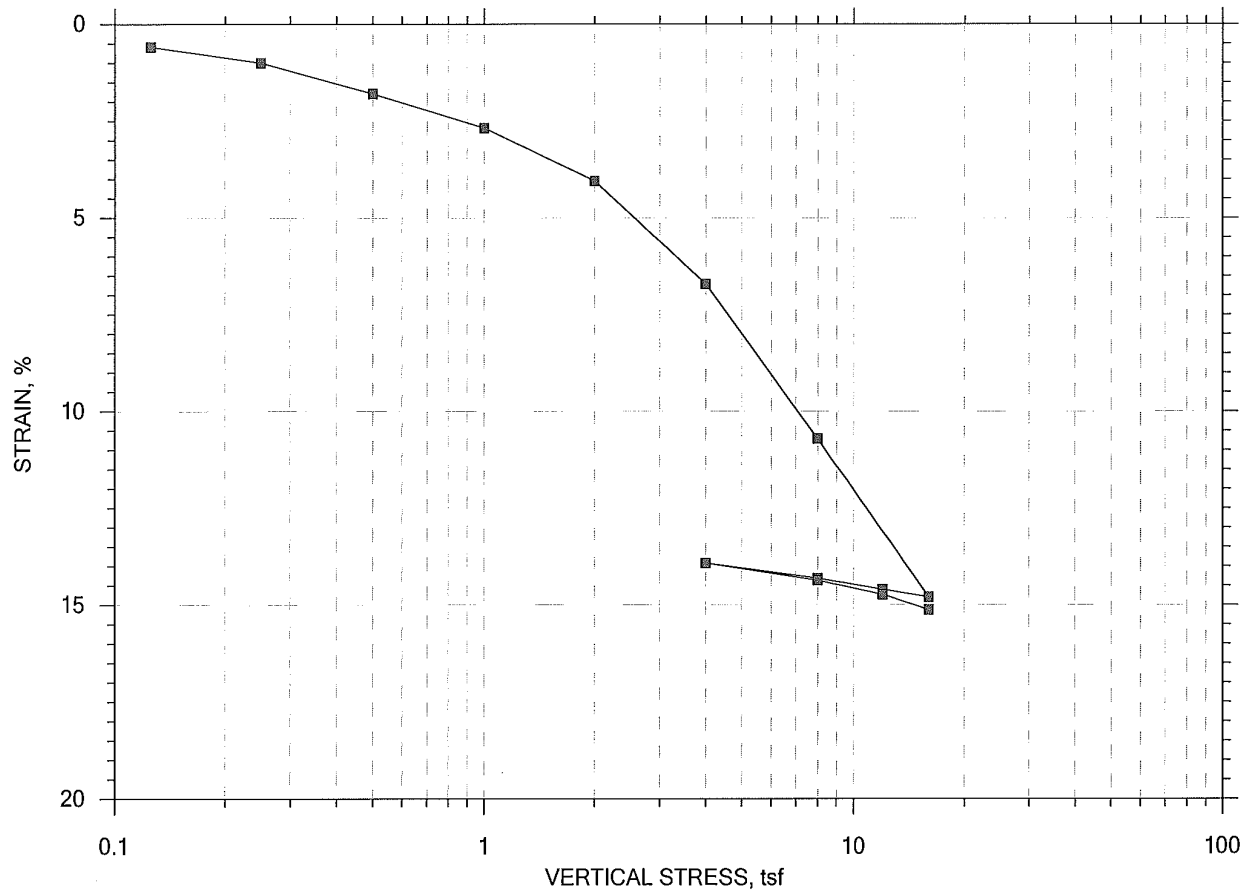
Stress: 16 tsf




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-3	Test Date: 12/20/13	Test No.: IP-4
	Depth: 34-36 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System Y		

One-Dimensional Consolidation by ASTM D2435 - Method B

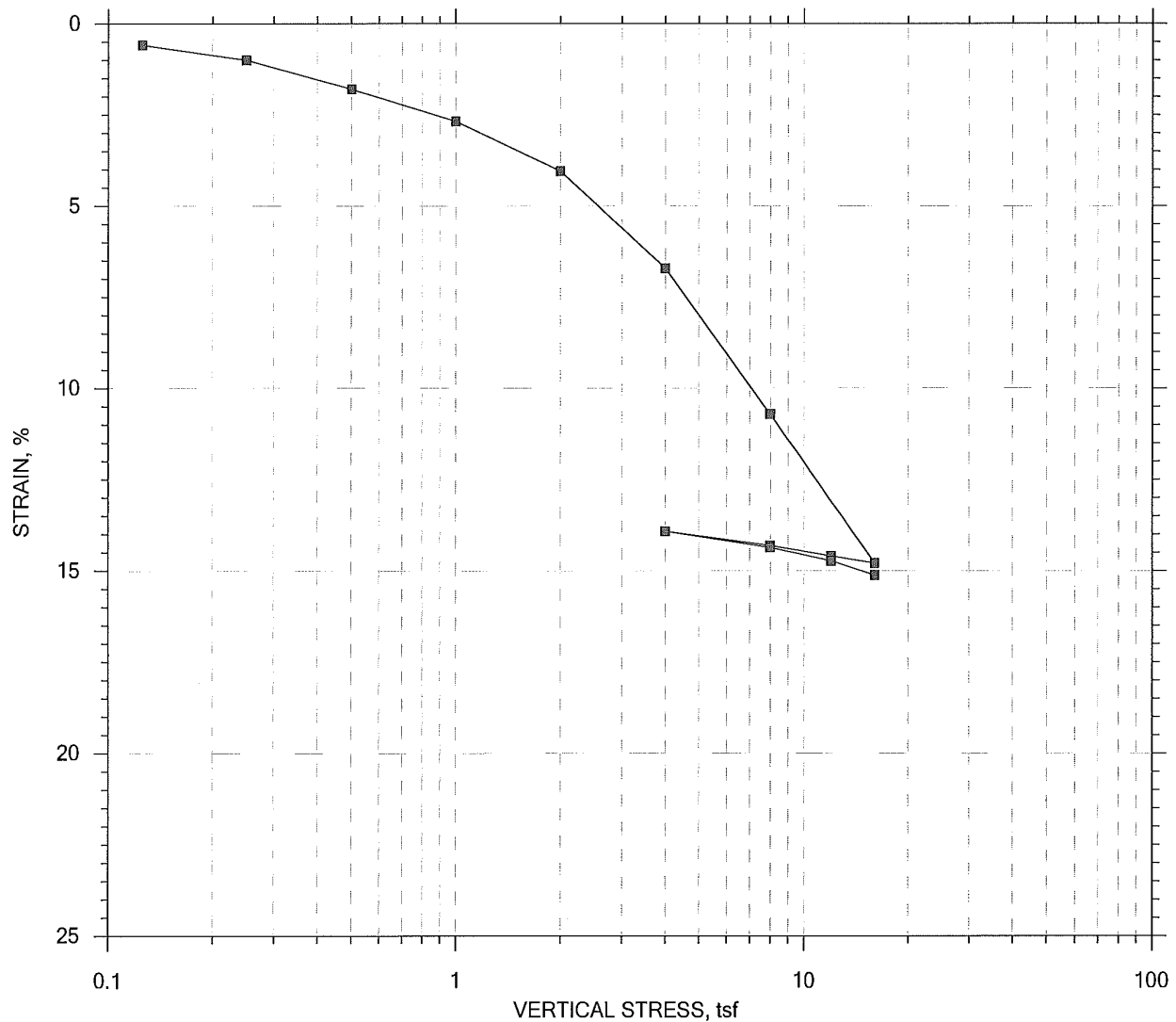
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test	
Current Vertical Effective Stress: ---			Water Content, %	30.21	21.51	
Preconsolidation Stress: ---			Dry Unit Weight, pcf	94.139	109.46	
Compression Ratio: ---			Saturation, %	98.12	100.00	
Diameter: 2.5 in		Height: 1 in		Void Ratio	0.87	0.61
LL: ---	PL: ---	PI: ---	GS: 2.82			

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-7
Test No.: IP-3

Location: Chelsea, MA
Tested By: md
Test Date: 12/20/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 59-61 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System R

Estimated Specific Gravity: 2.82
Initial Void Ratio: 0.867
Final Void Ratio: 0.606

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.86 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	11882	RING		13286
Wt. Container + Wet Soil, gm	278.10	267.40	256.84	156.37
Wt. Container + Dry Soil, gm	216.17	230.75	230.75	130.14
Wt. Container, gm	7.6400	109.45	109.45	8.1900
Wt. Dry Soil, gm	208.53	121.30	121.30	121.95
Water Content, %	29.70	30.21	21.51	21.51
Void Ratio	----	0.867	0.606	----
Degree of Saturation, %	----	98.12	100.00	----
Dry Unit Weight, pcf	----	94.139	109.46	----

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-7
Test No.: IP-3

Location: Chelsea, MA
Tested By: md
Test Date: 12/20/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 59-61 ft
Elevation: ----

Soil Description: Moist, greenish gray clay
Remarks: System R

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.125	0.005820	0.856	0.582	1.730	1.41e-005	4.66e-002	1.77e-003	
2	0.250	0.009936	0.848	0.994	5.434	4.45e-006	3.29e-002	3.95e-004	
3	0.500	0.01795	0.833	1.79	2.854	8.36e-006	3.20e-002	7.22e-004	
4	1.00	0.02674	0.817	2.67	5.372	4.37e-006	1.76e-002	2.07e-004	
5	2.00	0.04041	0.791	4.04	3.848	5.96e-006	1.37e-002	2.20e-004	
6	4.00	0.06708	0.742	6.71	7.902	2.78e-006	1.33e-002	1.00e-004	
7	8.00	0.1070	0.667	10.7	6.760	3.03e-006	9.99e-003	8.15e-005	
8	16.0	0.1479	0.591	14.8	4.043	4.62e-006	5.11e-003	6.37e-005	
9	12.0	0.1460	0.594	14.6	2.004	8.91e-006	4.94e-004	1.19e-005	
10	8.00	0.1431	0.600	14.3	0.915	1.96e-005	7.15e-004	3.78e-005	
11	4.00	0.1392	0.607	13.9	2.139	8.46e-006	9.75e-004	2.23e-005	
12	8.00	0.1436	0.599	14.4	1.052	1.72e-005	1.11e-003	5.16e-005	
13	12.0	0.1473	0.592	14.7	1.043	1.72e-005	9.15e-004	4.24e-005	
14	16.0	0.1512	0.585	15.1	9.276	1.91e-006	9.72e-004	5.02e-006	

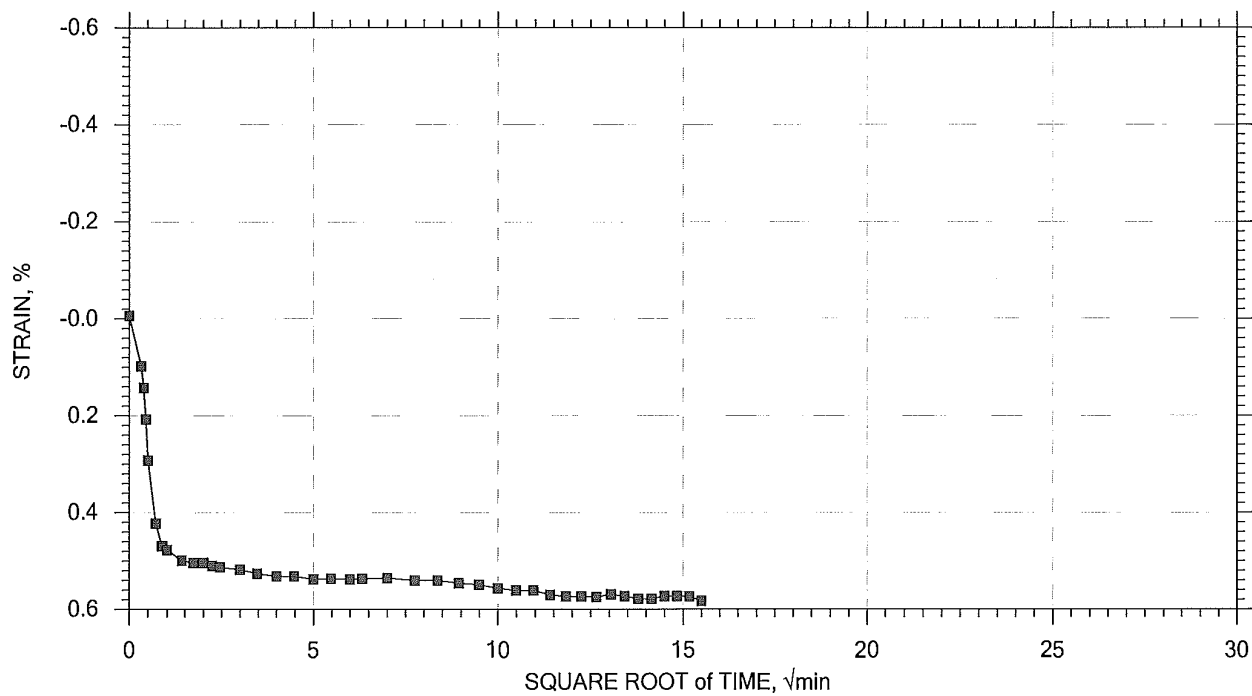
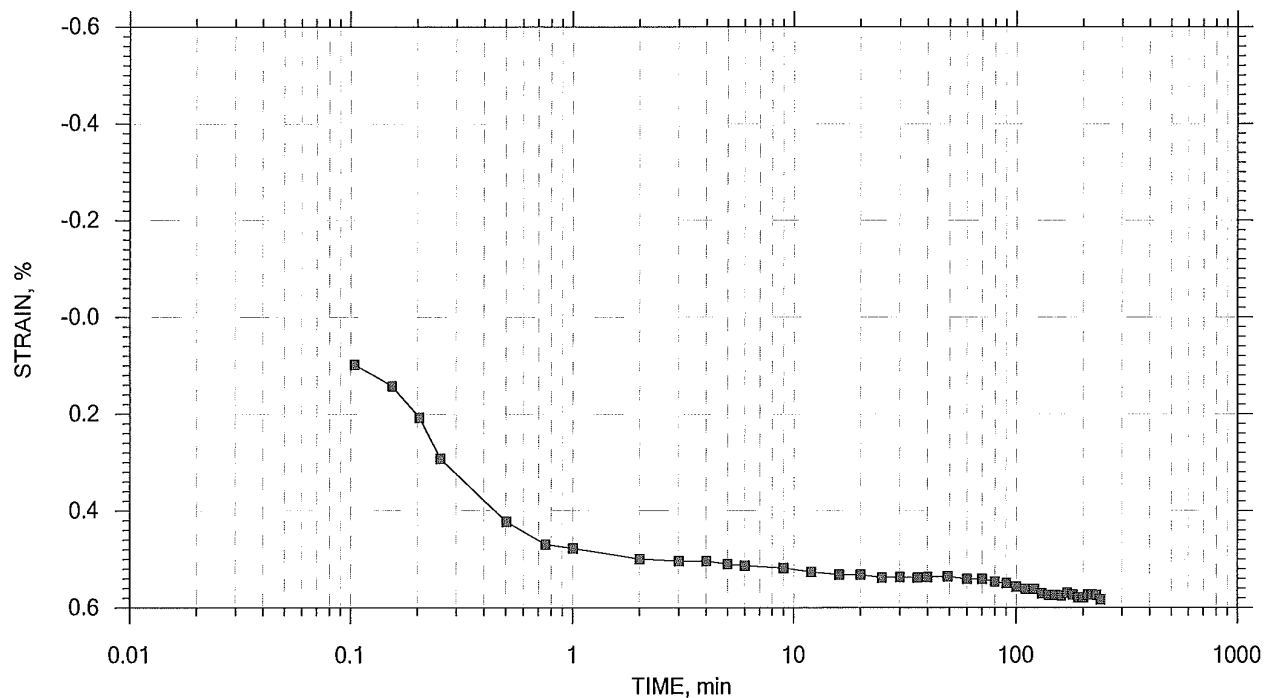
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.125	0.005820	0.856	0.582	0.264	2.15e-005	4.66e-002	2.70e-003	0.00e+000
2	0.250	0.009936	0.848	0.994	0.000	0.00e+000	3.29e-002	0.00e+000	0.00e+000
3	0.500	0.01795	0.833	1.79	0.693	8.00e-006	3.20e-002	6.92e-004	0.00e+000
4	1.00	0.02674	0.817	2.67	0.945	5.77e-006	1.76e-002	2.73e-004	0.00e+000
5	2.00	0.04041	0.791	4.04	0.981	5.43e-006	1.37e-002	2.00e-004	0.00e+000
6	4.00	0.06708	0.742	6.71	1.440	3.54e-006	1.33e-002	1.27e-004	0.00e+000
7	8.00	0.1070	0.667	10.7	1.708	2.78e-006	9.99e-003	7.49e-005	0.00e+000
8	16.0	0.1479	0.591	14.8	1.270	3.42e-006	5.11e-003	4.71e-005	0.00e+000
9	12.0	0.1460	0.594	14.6	0.000	0.00e+000	4.94e-004	0.00e+000	0.00e+000
10	8.00	0.1431	0.600	14.3	0.000	0.00e+000	7.15e-004	0.00e+000	0.00e+000
11	4.00	0.1392	0.607	13.9	0.000	0.00e+000	9.75e-004	0.00e+000	0.00e+000
12	8.00	0.1436	0.599	14.4	0.222	1.89e-005	1.11e-003	5.68e-005	0.00e+000
13	12.0	0.1473	0.592	14.7	0.000	0.00e+000	9.15e-004	0.00e+000	0.00e+000
14	16.0	0.1512	0.585	15.1	0.000	0.00e+000	9.72e-004	0.00e+000	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 14

Stress: 0.125 tsf



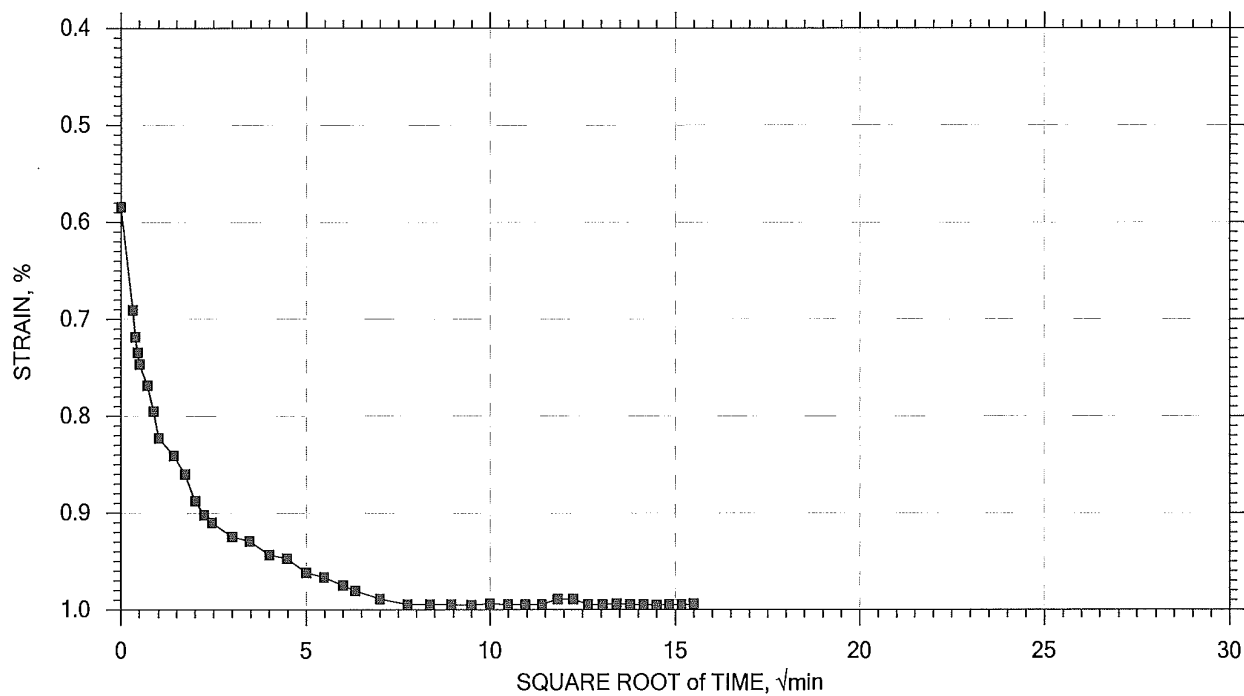
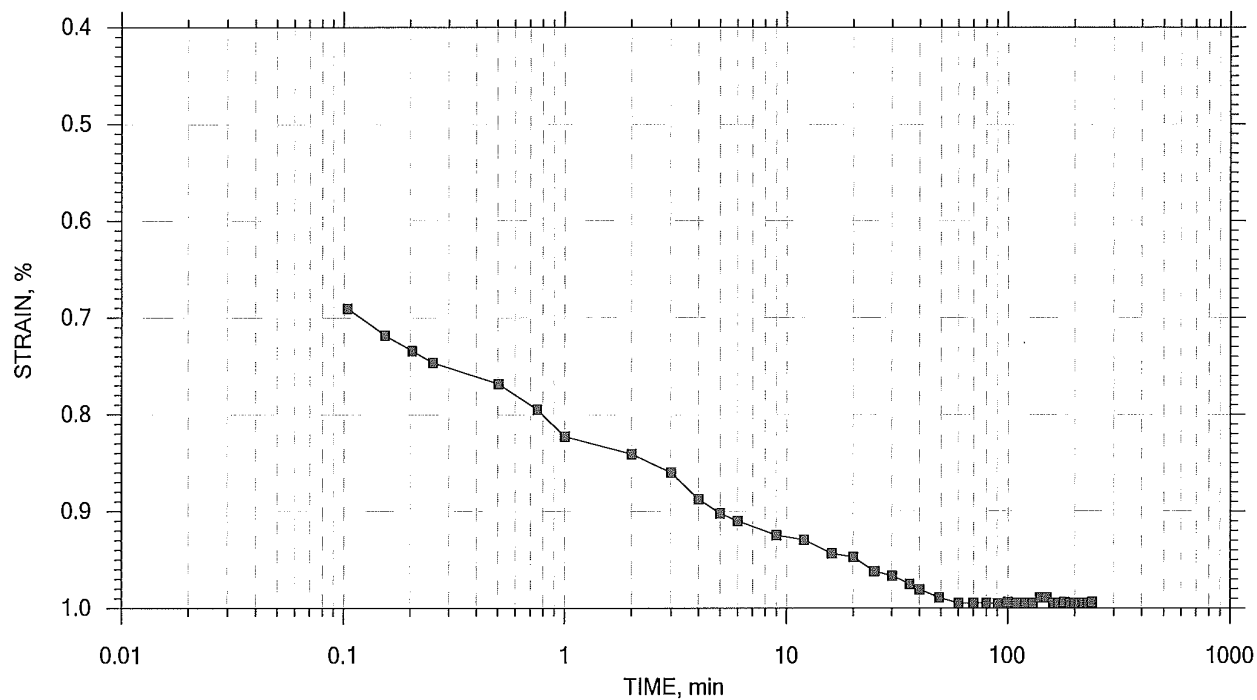
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 14

Stress: 0.25 tsf



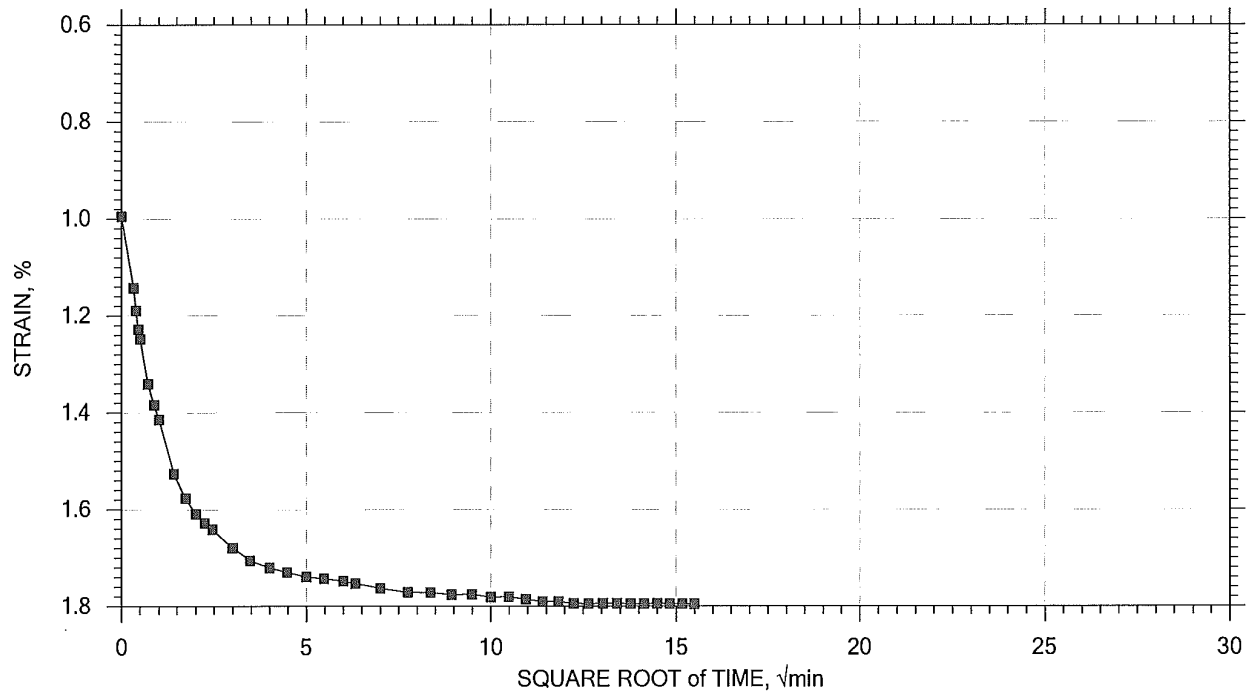
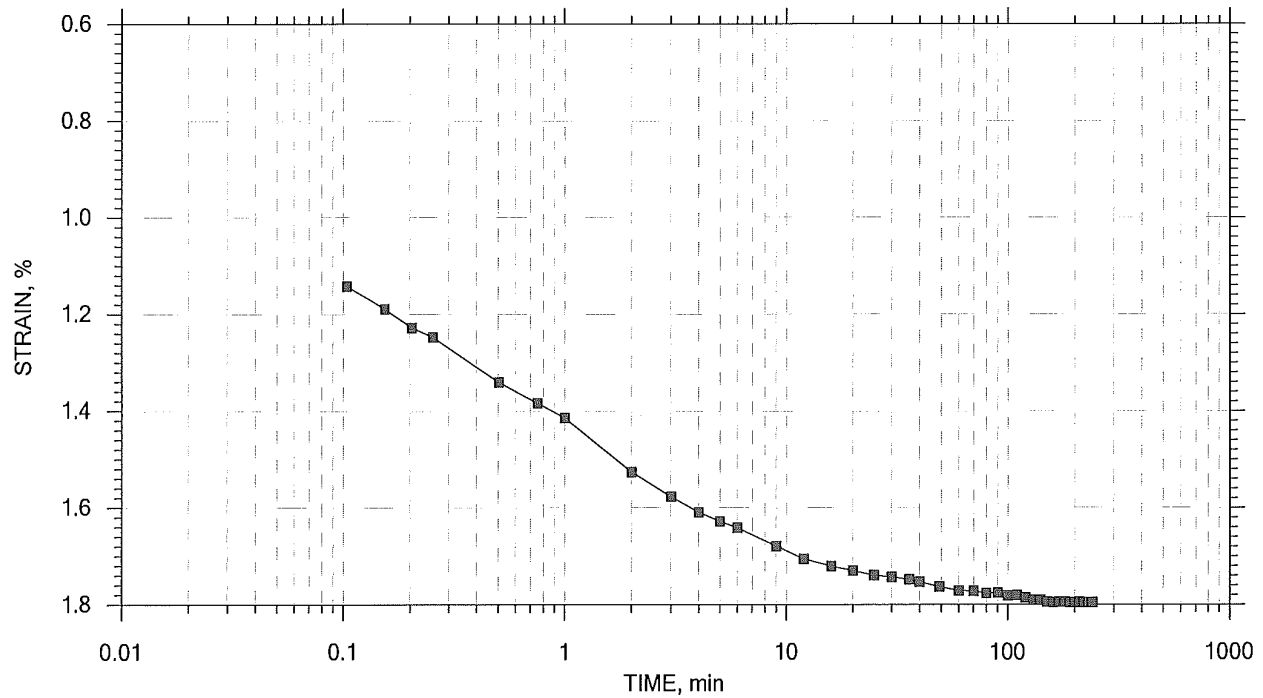
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 14

Stress: 0.5 tsf



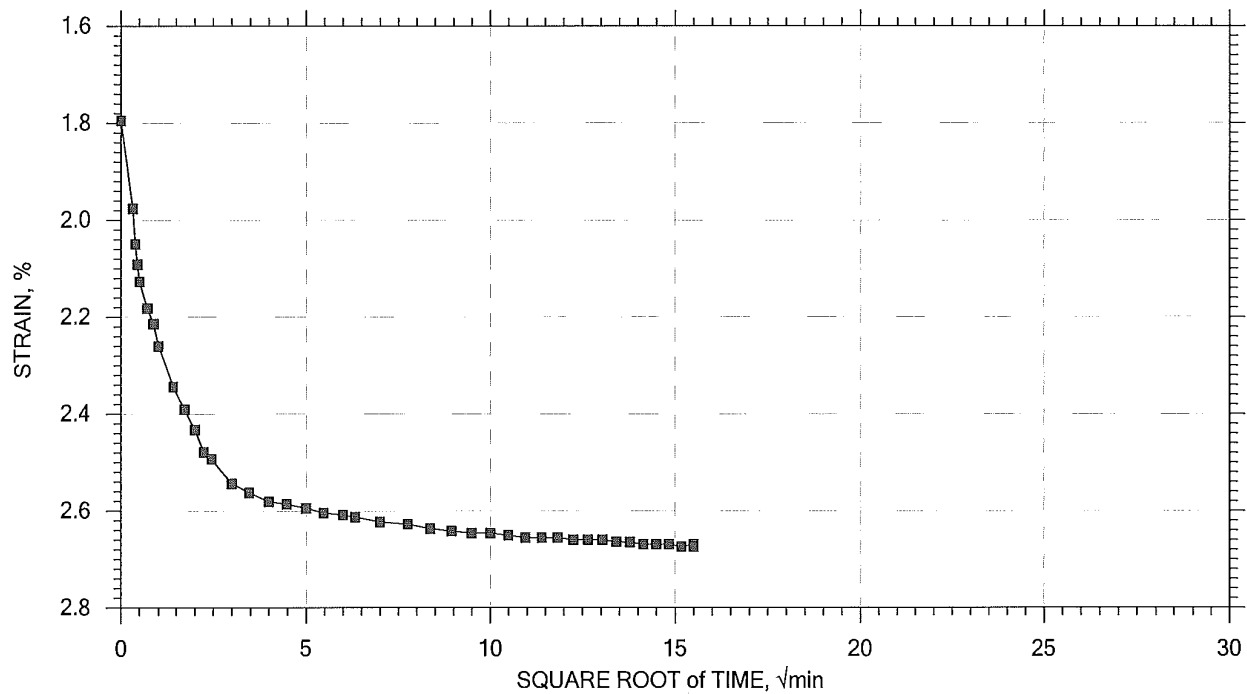
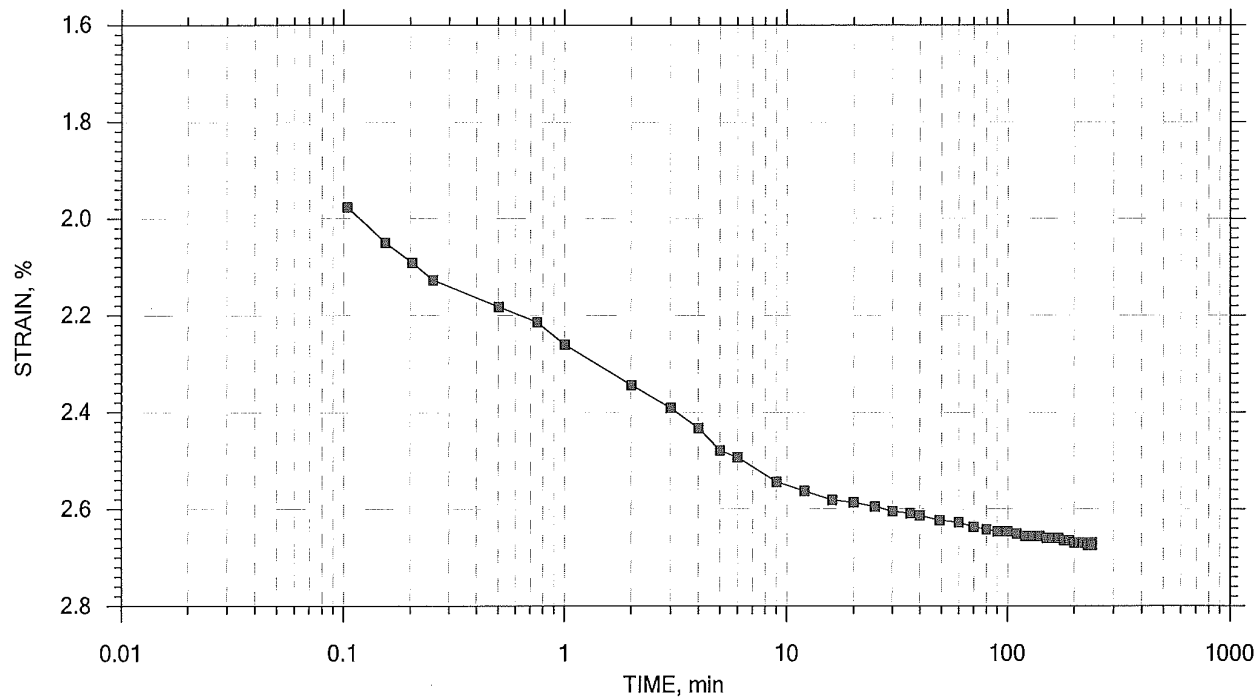
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 14

Stress: 1 tsf



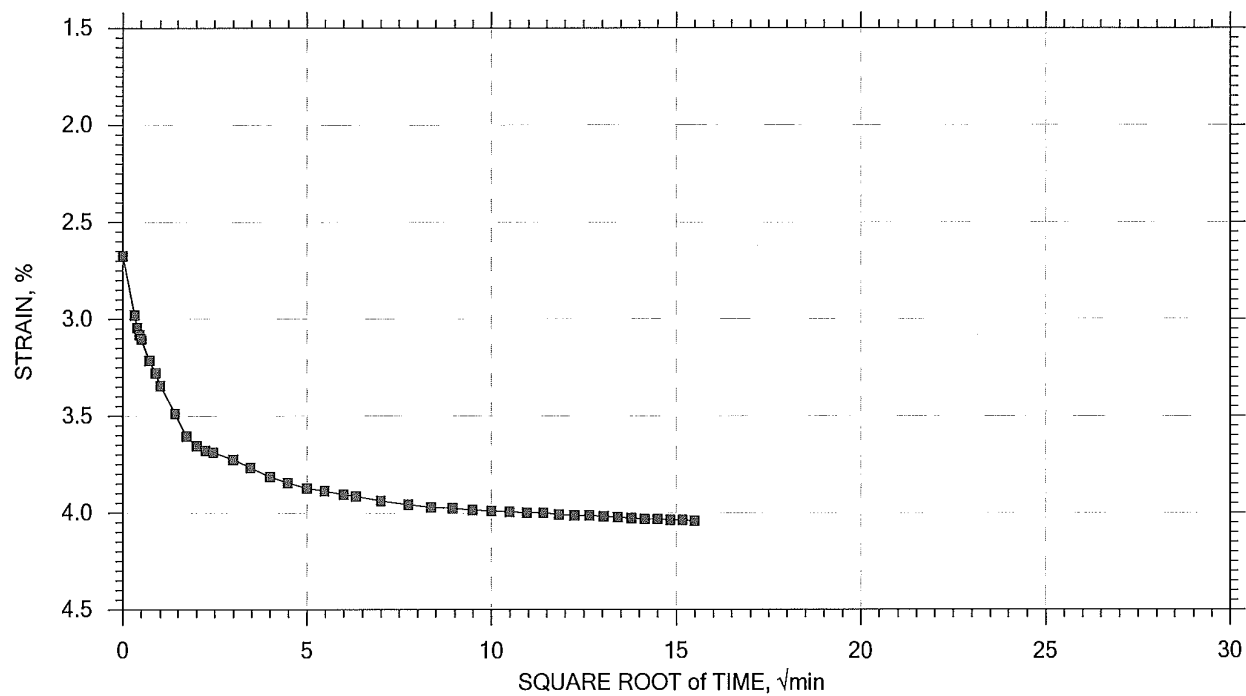
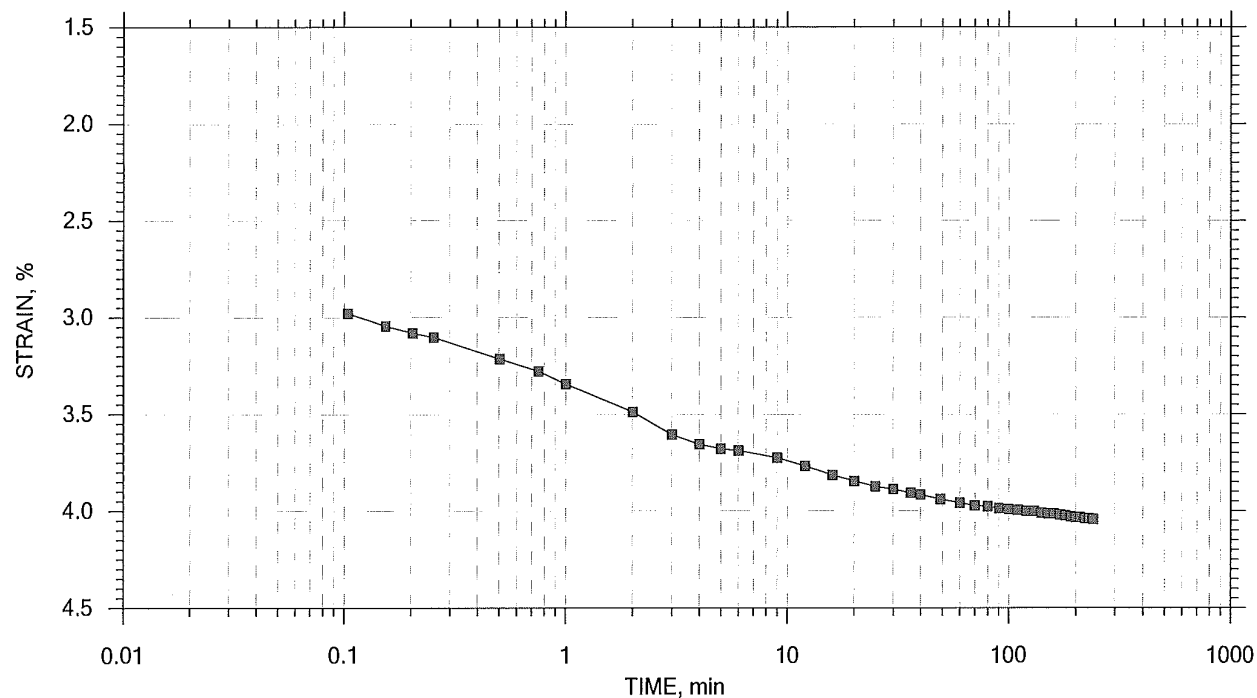
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 14

Stress: 2 tsf



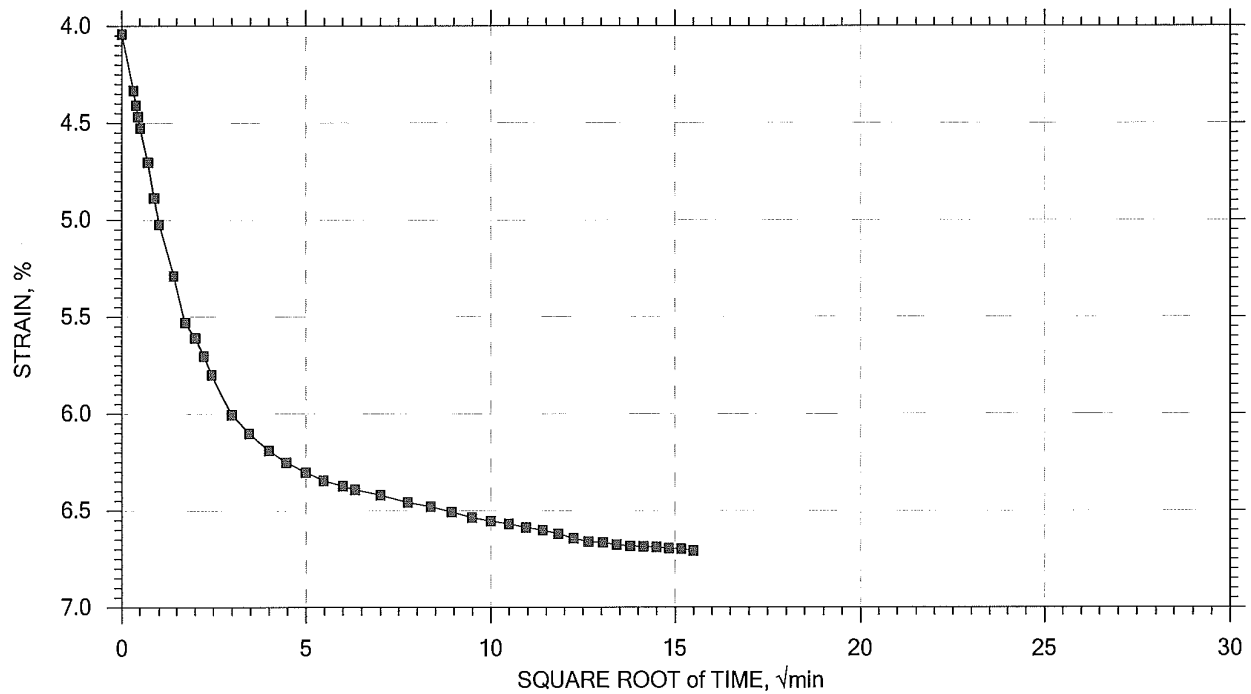
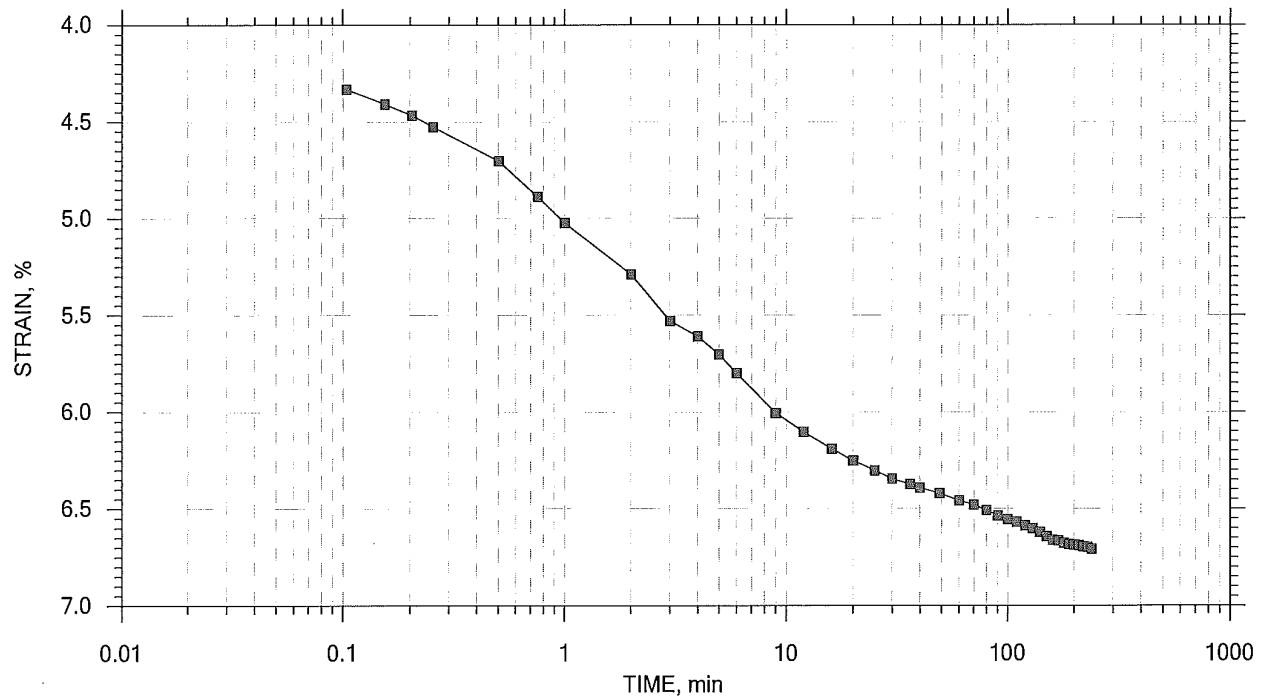
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 14

Stress: 4 tsf



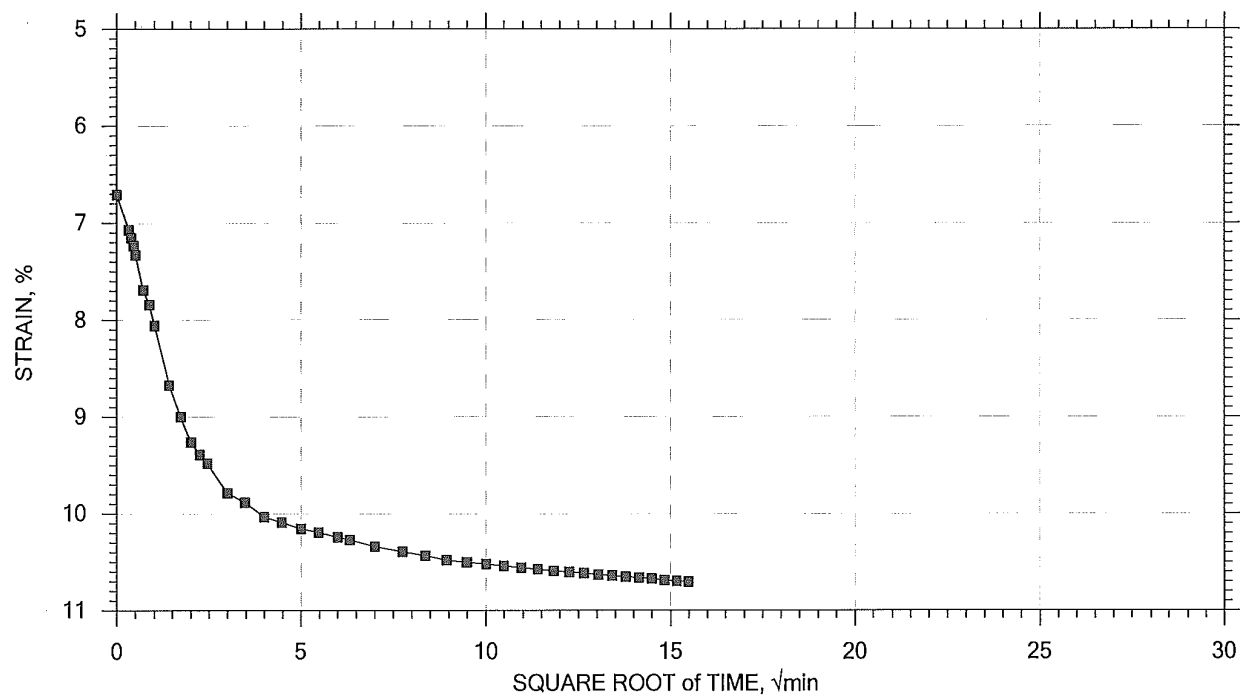
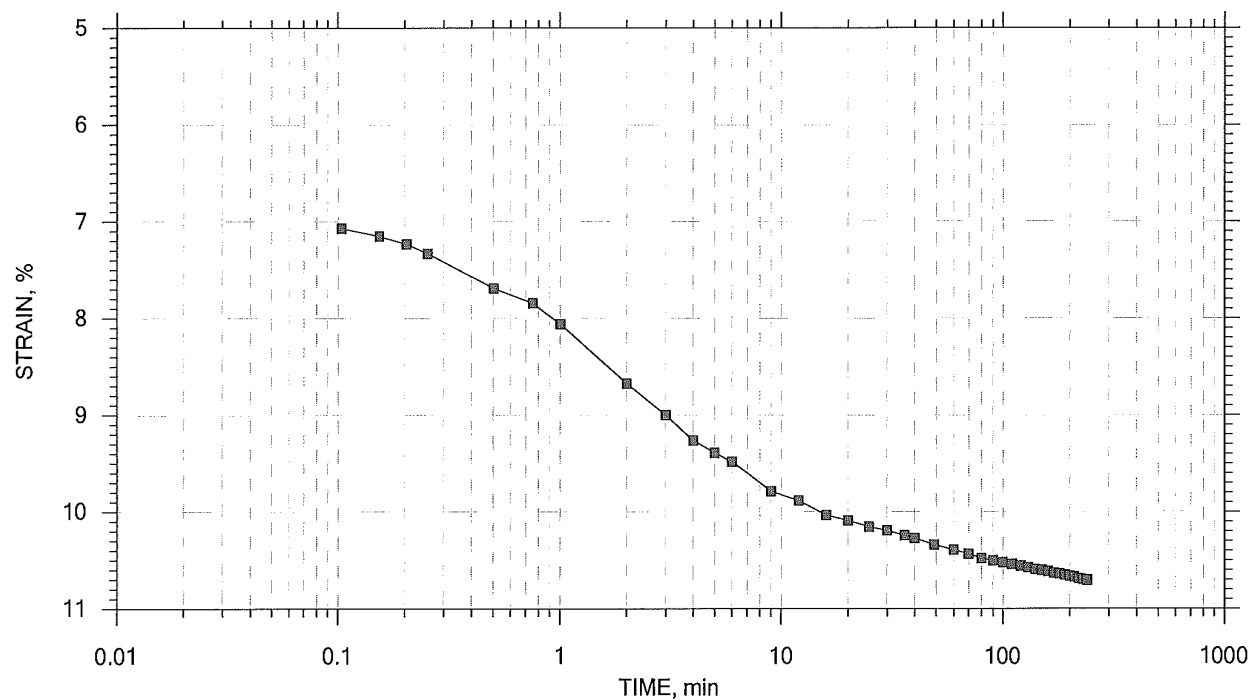
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 14

Stress: 8 tsf



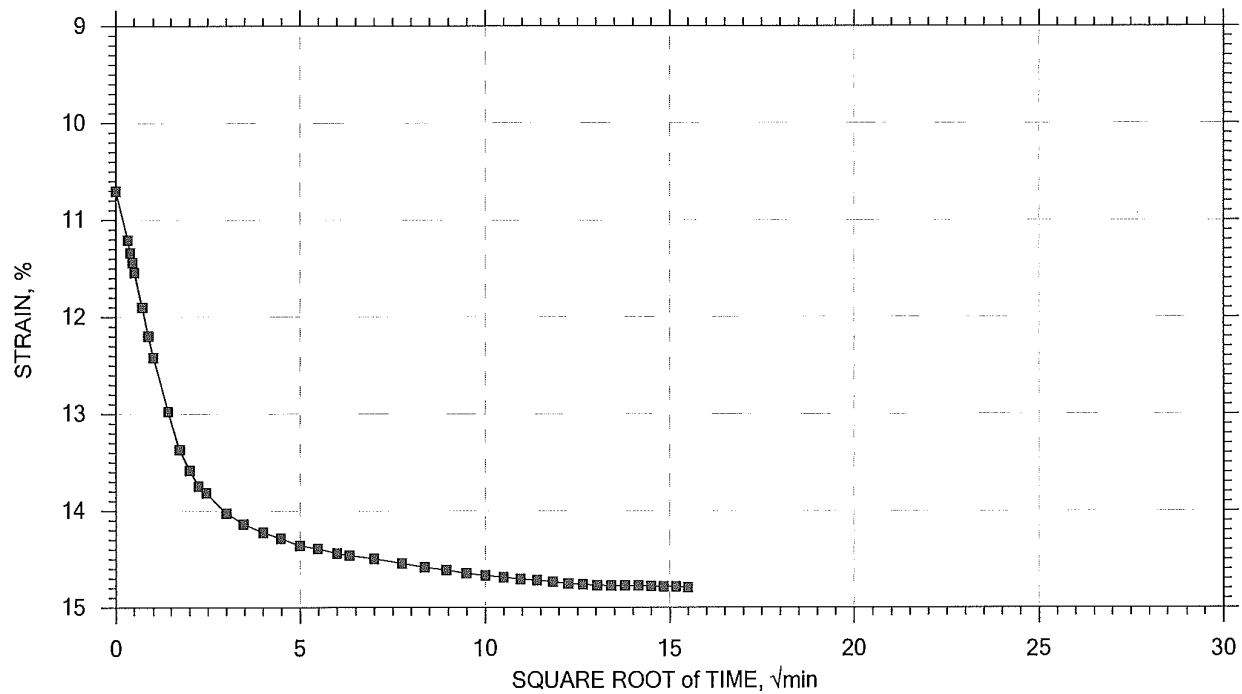
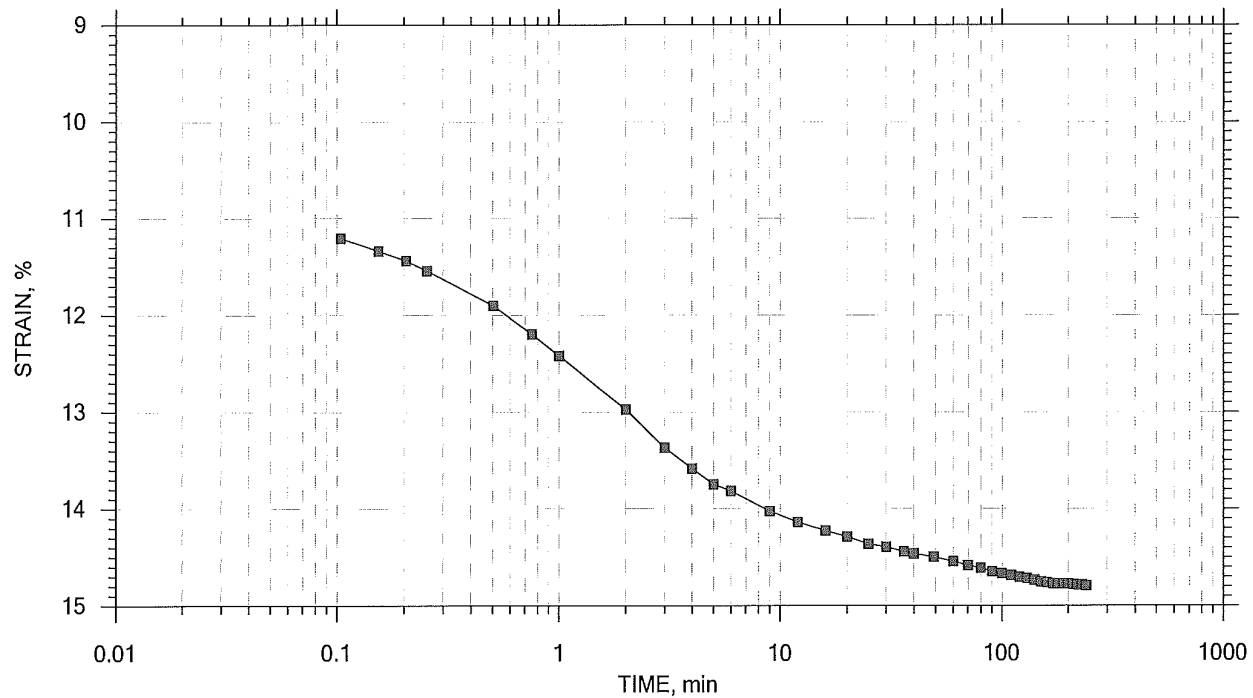
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 14

Stress: 16 tsf



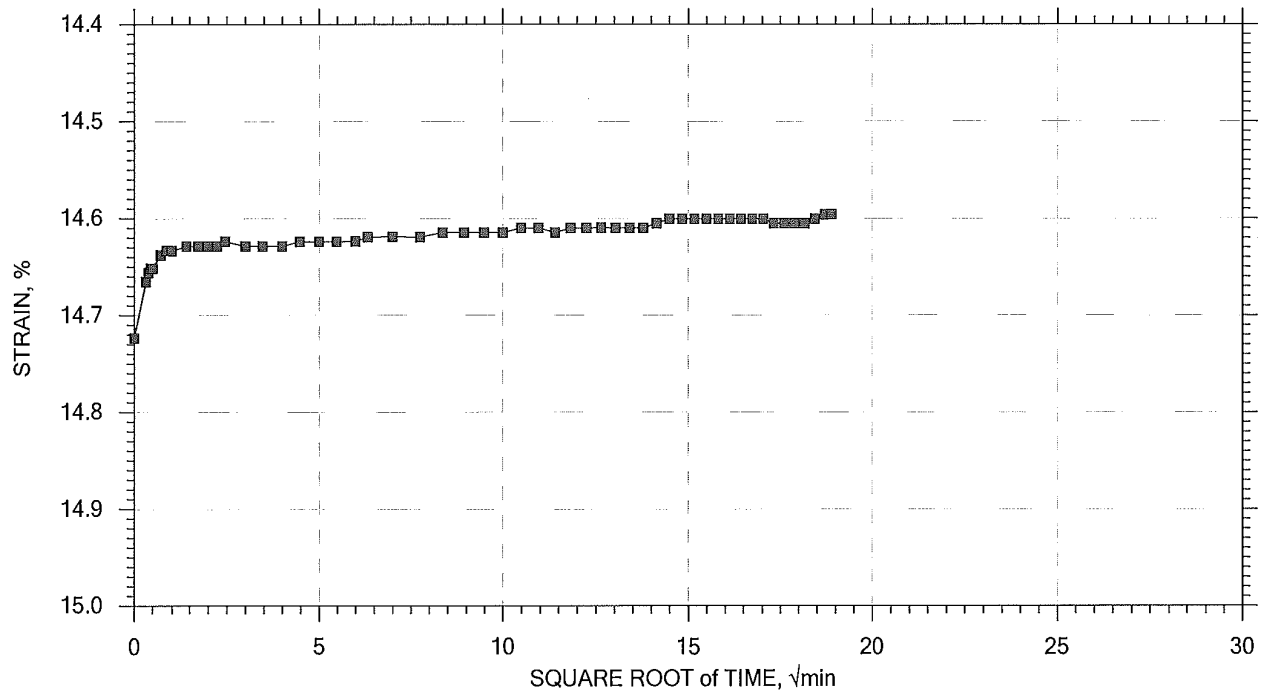
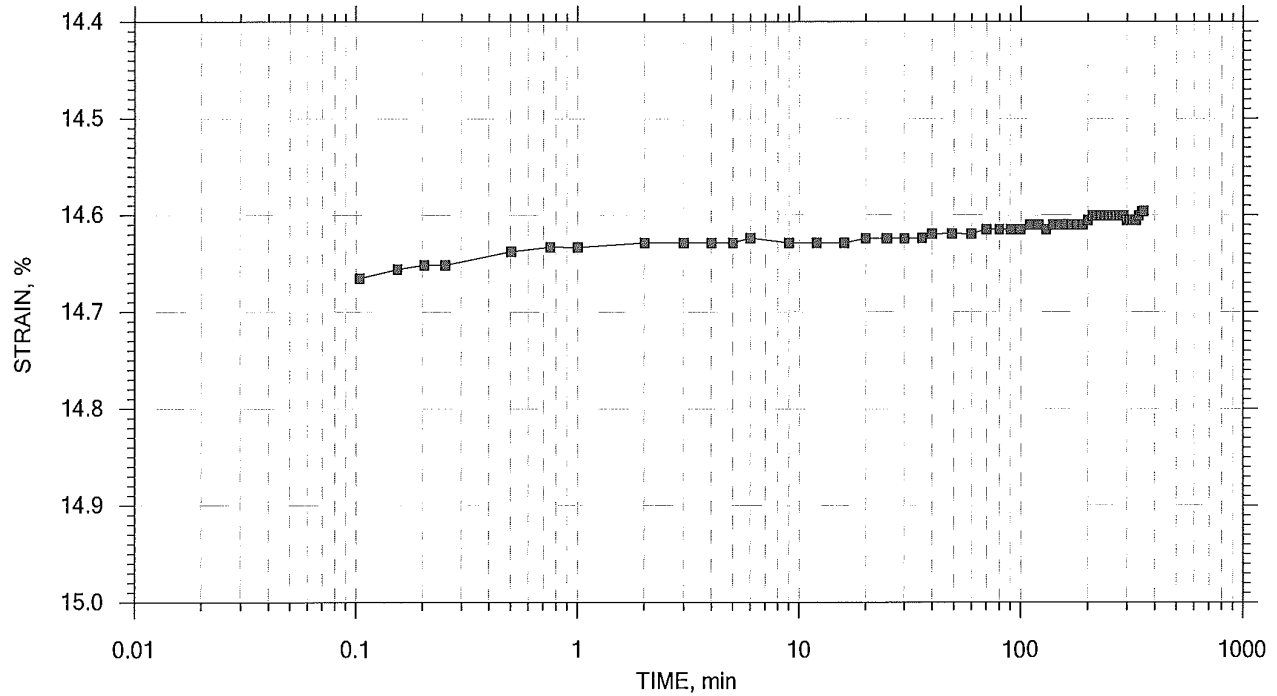
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 14

Stress: 12 tsf



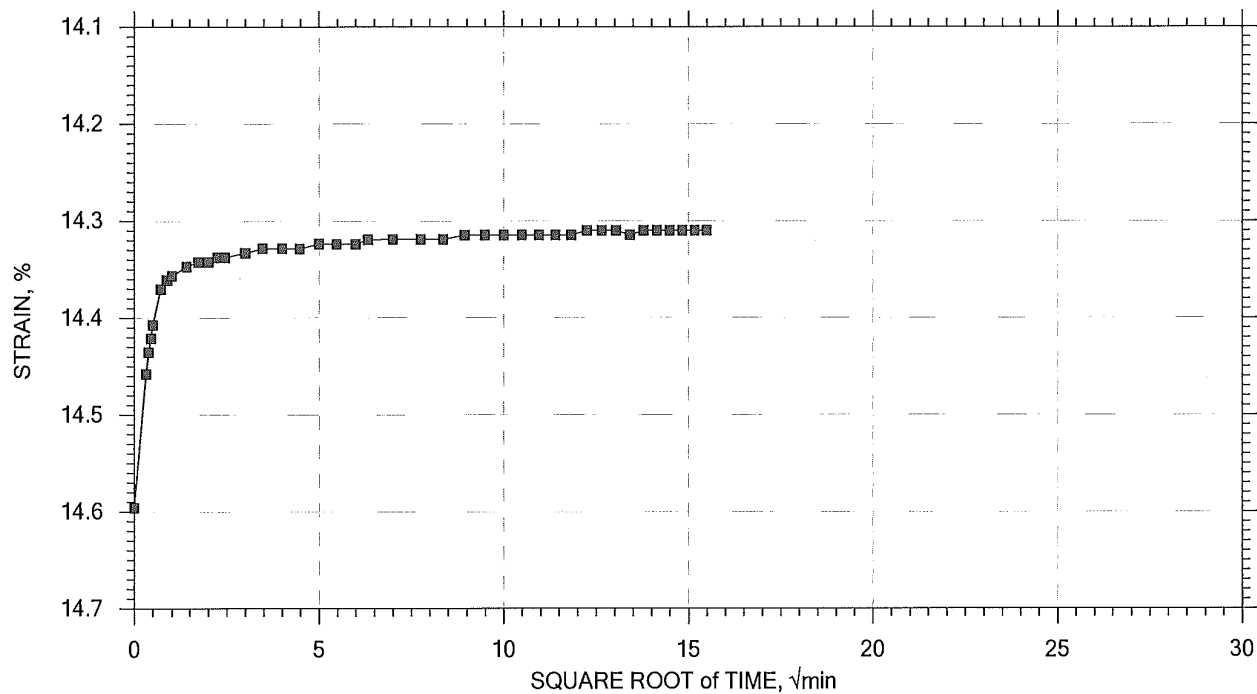
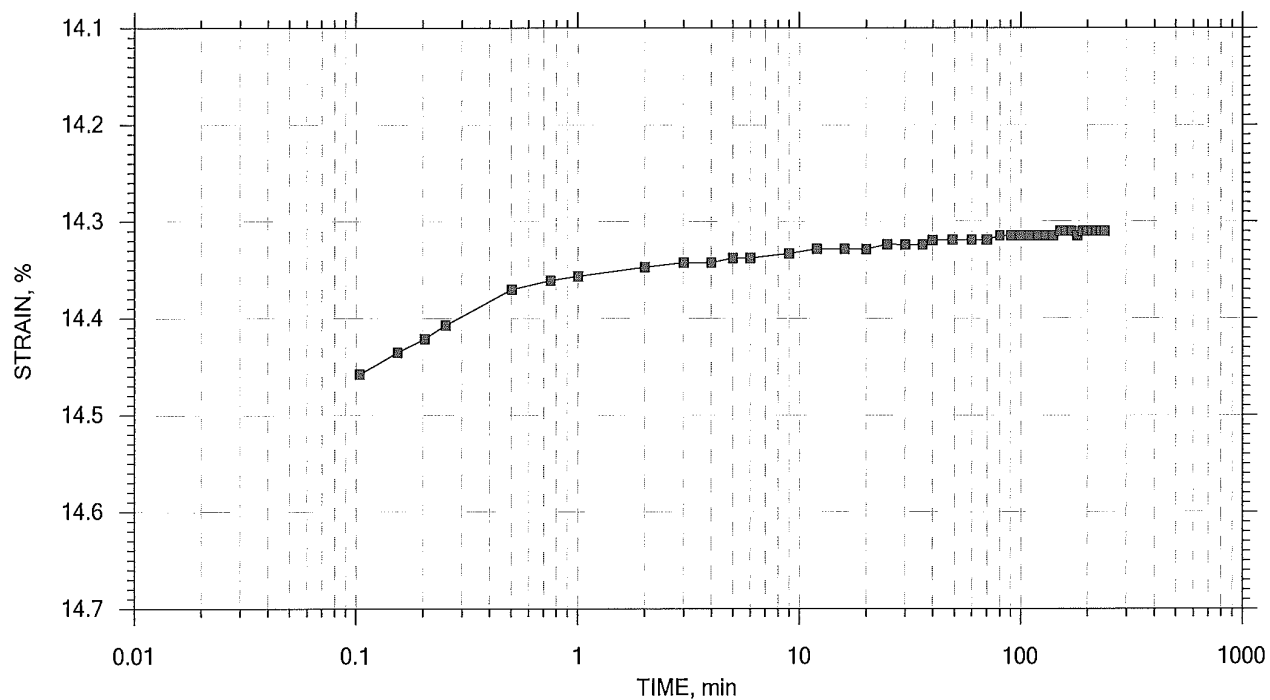
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 14

Stress: 8 tsf



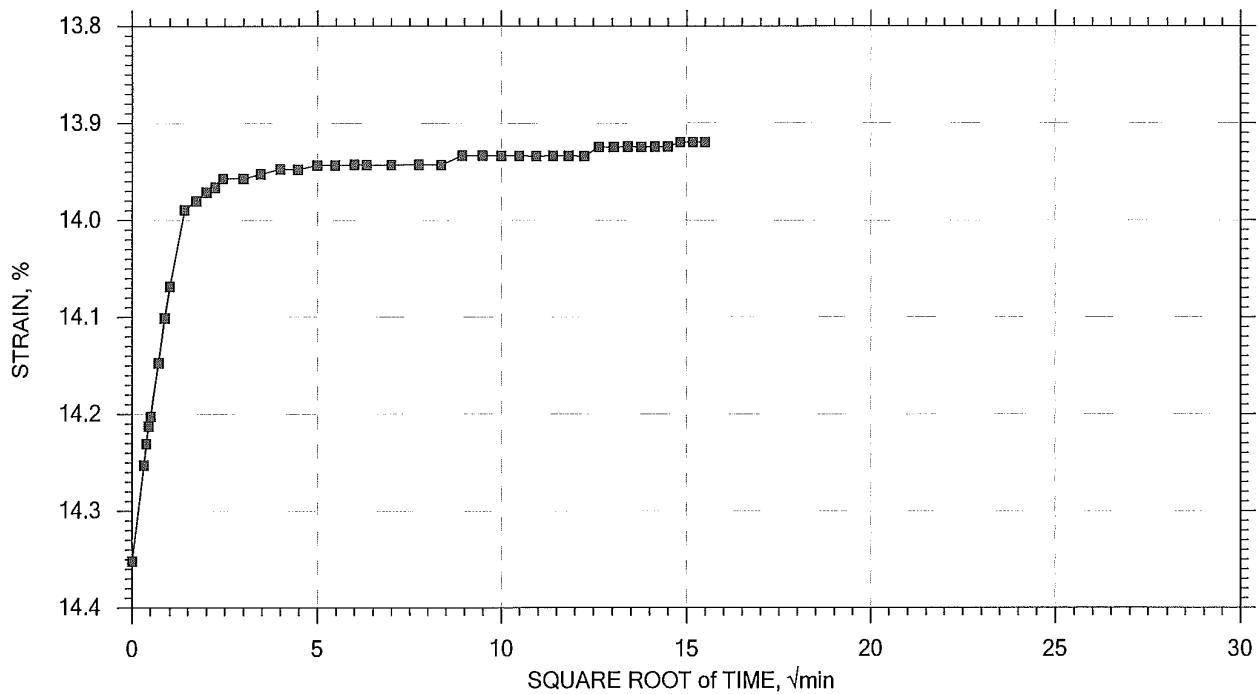
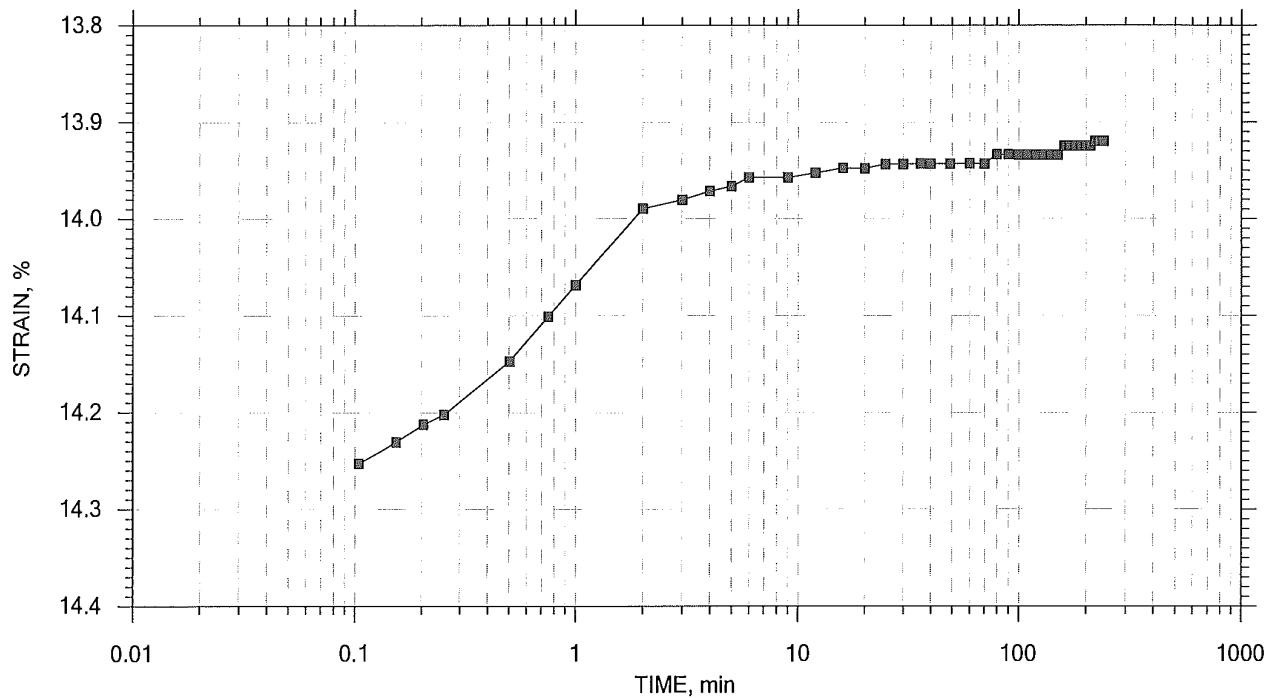
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 14

Stress: 4 tsf



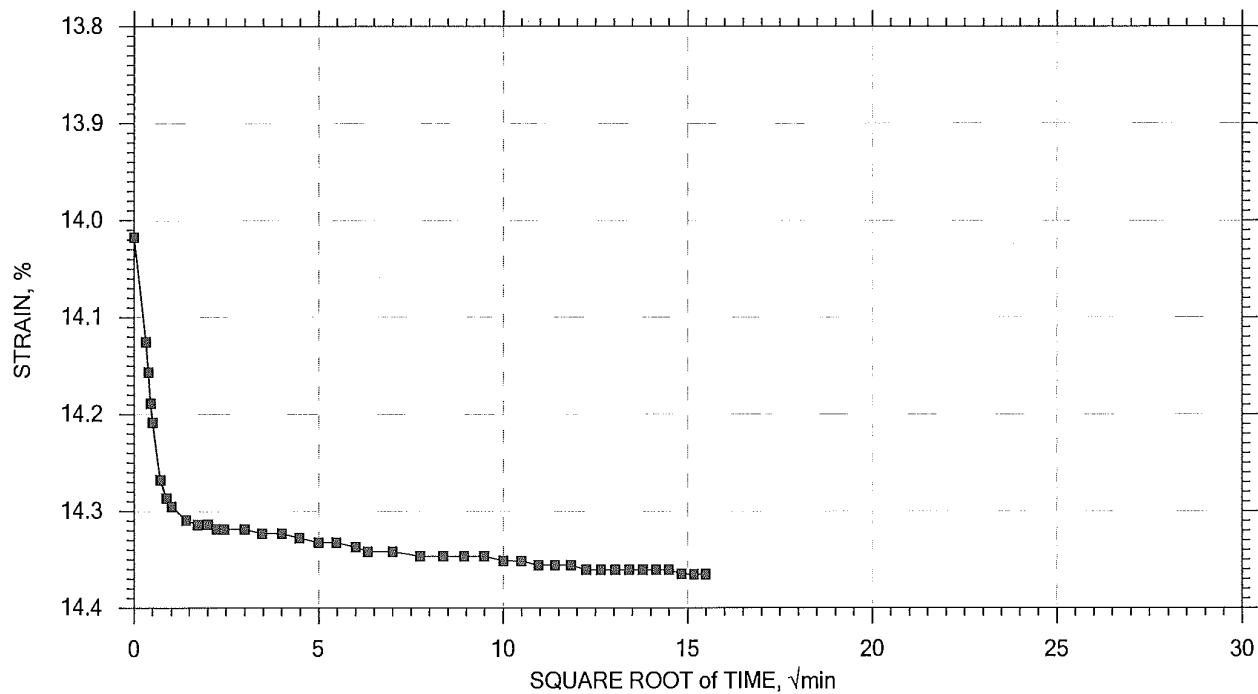
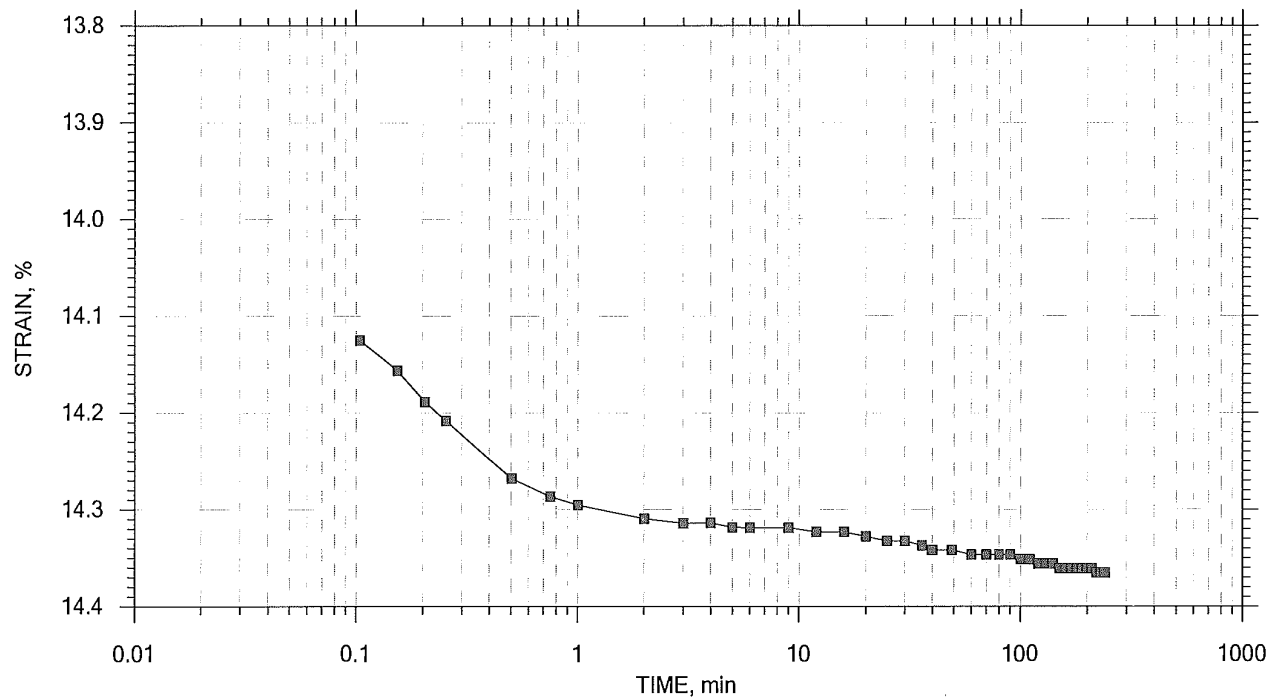
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 14

Stress: 8 tsf



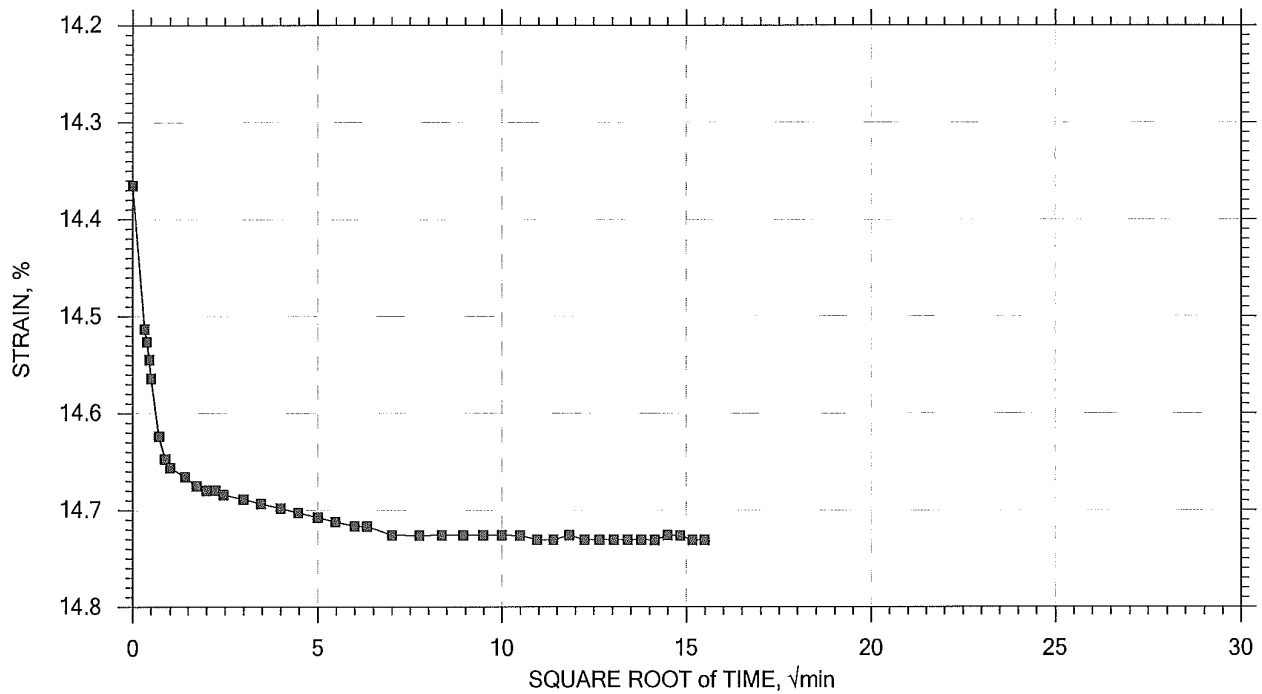
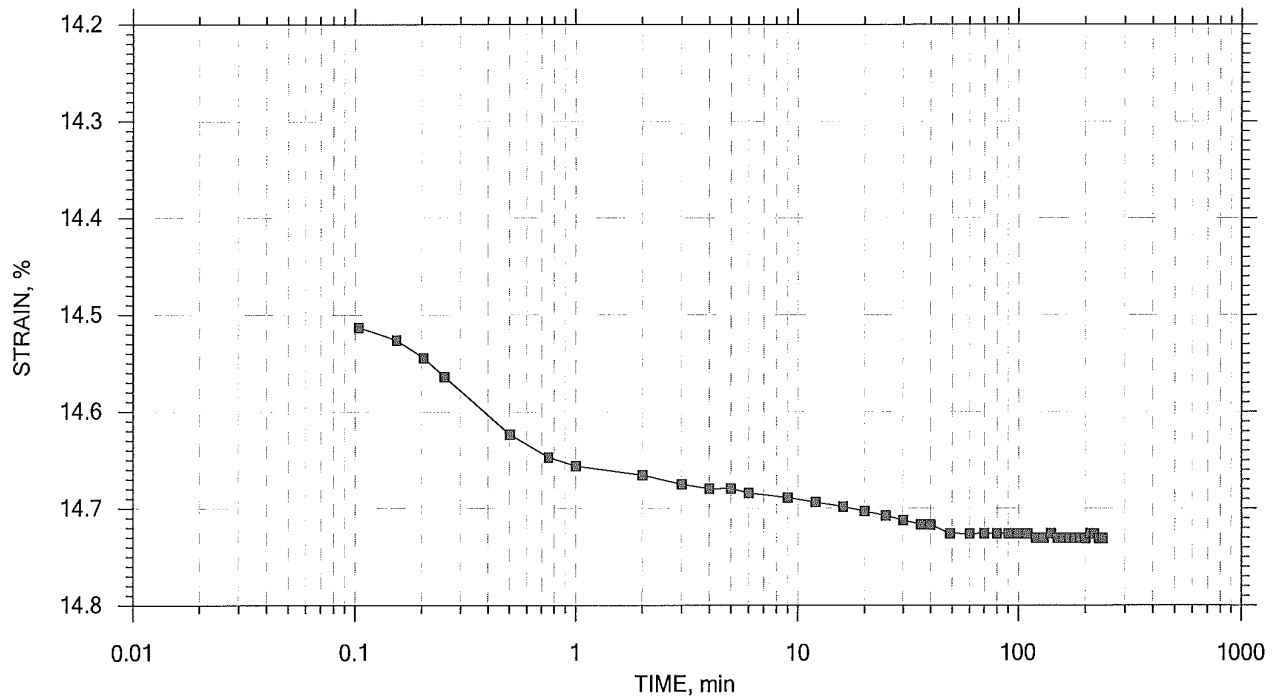
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 14

Stress: 12 tsf



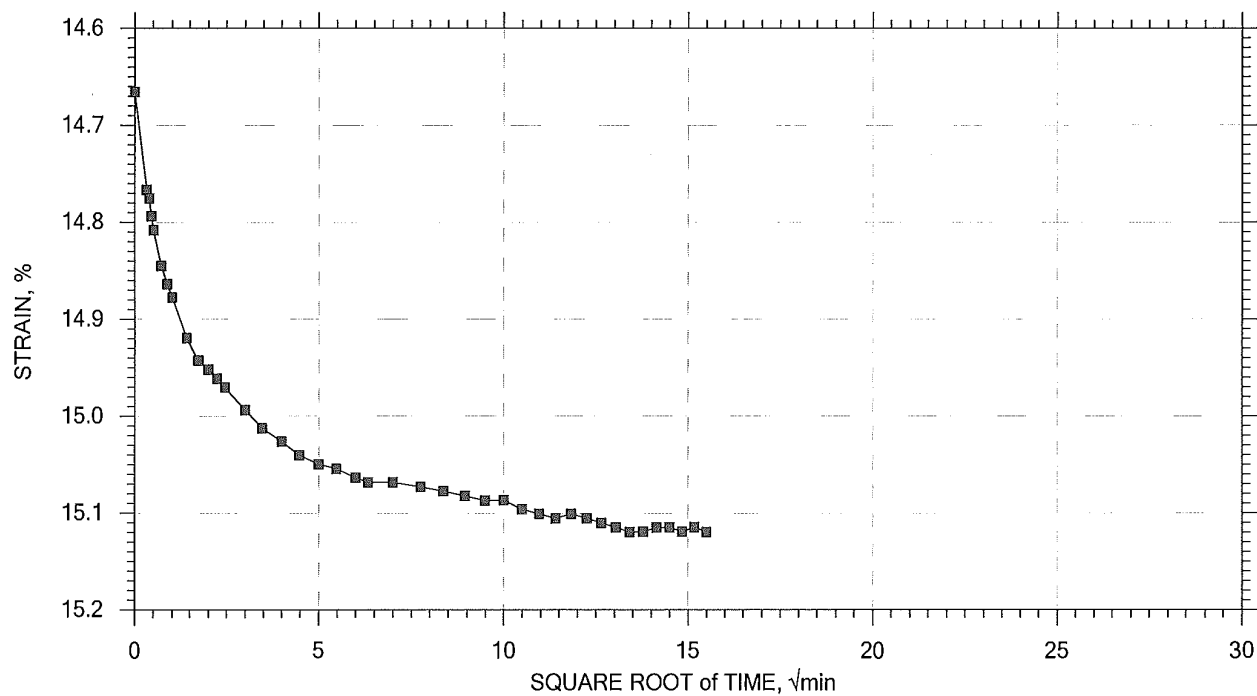
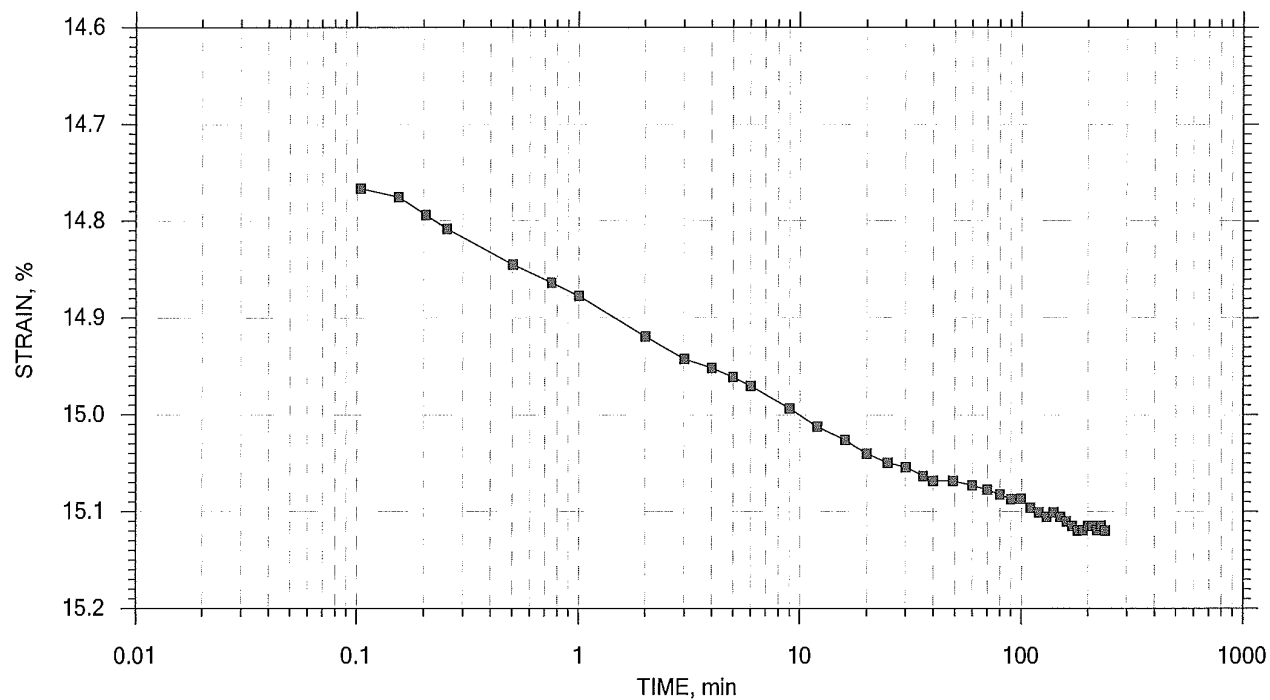
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	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 14

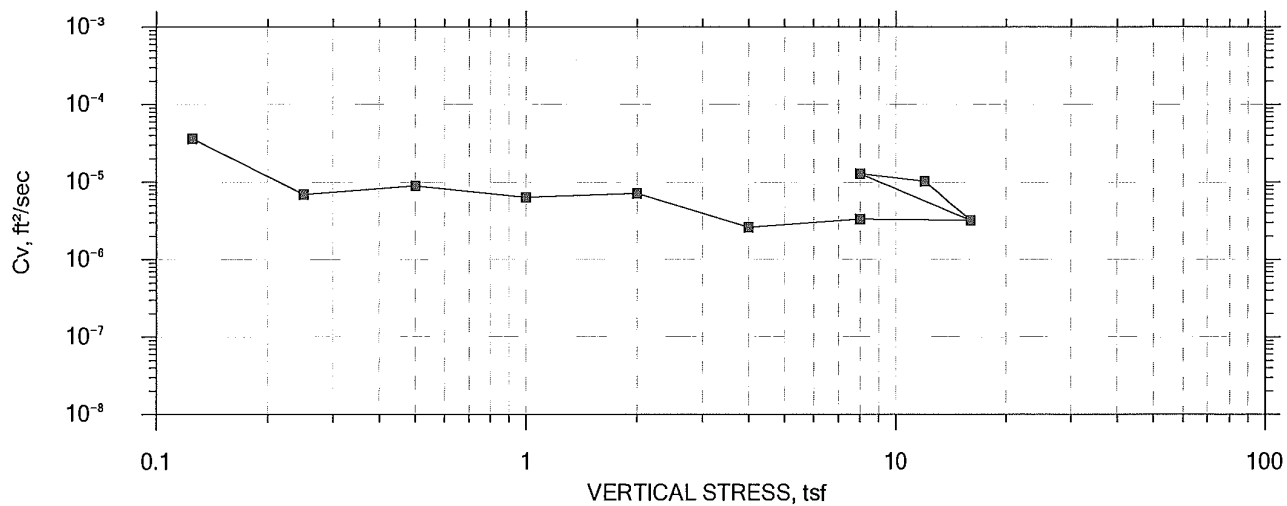
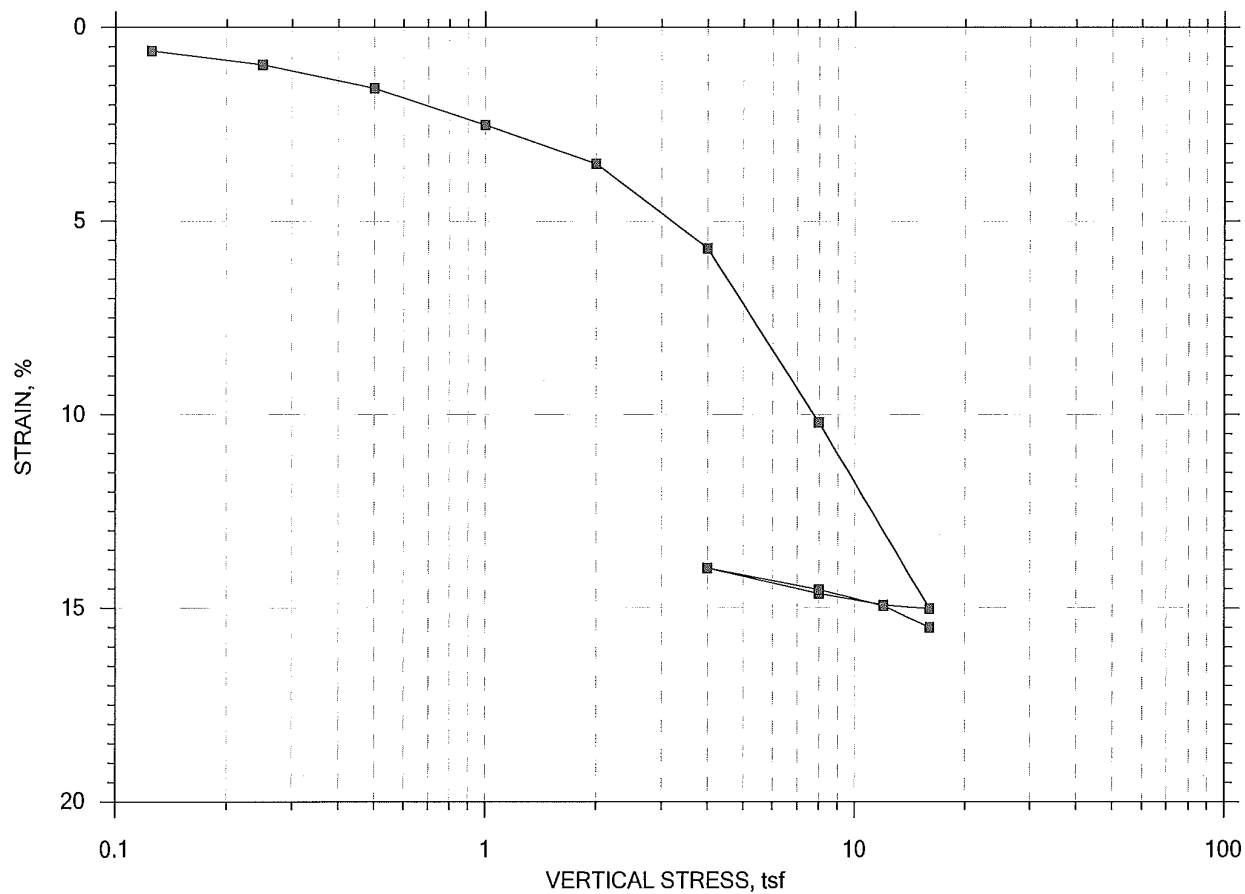
Stress: 16 tsf




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-7	Test Date: 12/20/13	Test No.: IP-3
	Depth: 59-61 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System R		

One-Dimensional Consolidation by ASTM D2435 - Method B

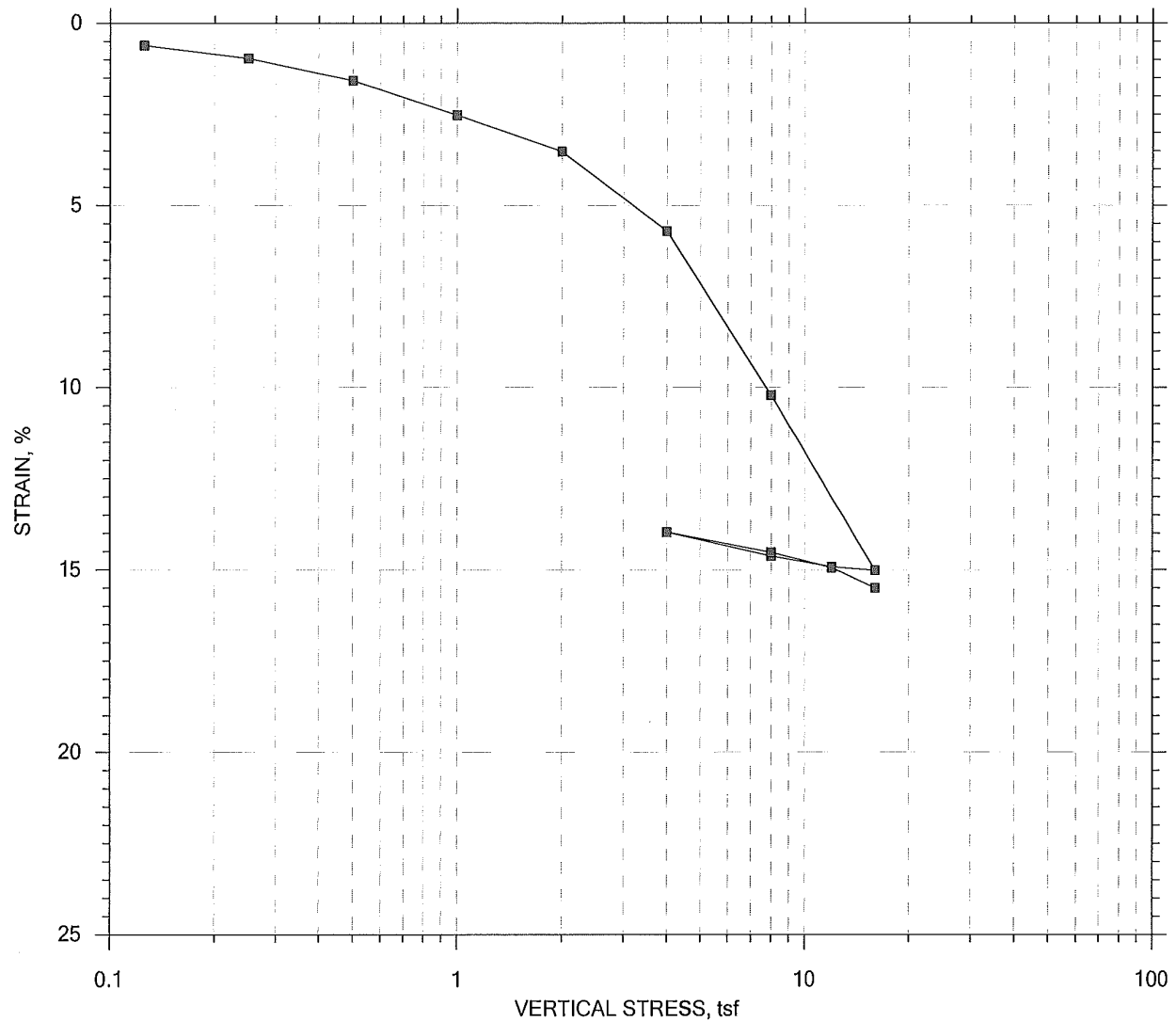
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test	
Current Vertical Effective Stress: ---			Water Content, %	29.85	22.06	
Preconsolidation Stress: ---			Dry Unit Weight, pcf	95.261	108.25	
Compression Ratio: ---			Saturation, %	99.75	100.00	
Diameter: 2.5 in		Height: 1 in		Void Ratio	0.84	0.62
LL: ---	PL: ---	PI: ---	GS: 2.81			

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-9
Test No.: IP-2

Location: Chelsea, MA
Tested By: md
Test Date: 12/19/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 79-81 ft
Elevation: ---

Soil Description: Moist, greenish gray clay with sand
Remarks: System X

Estimated Specific Gravity: 2.81
Initial Void Ratio: 0.840
Final Void Ratio: 0.619

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.88 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	11007	RING		13570
Wt. Container + Wet Soil, gm	469.30	268.27	258.71	157.85
Wt. Container + Dry Soil, gm	367.14	231.64	231.64	130.83
Wt. Container, gm	7.5700	108.89	108.89	8.3300
Wt. Dry Soil, gm	359.57	122.75	122.75	122.50
Water Content, %	28.41	29.85	22.06	22.06
Void Ratio	----	0.840	0.619	----
Degree of Saturation, %	----	99.75	100.00	----
Dry Unit Weight, pcf	----	95.261	108.25	----

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-47
Sample No.: OT-9
Test No.: IP-2

Location: Chelsea, MA
Tested By: md
Test Date: 12/19/13
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 79-81 ft
Elevation: ----

Soil Description: Moist, greenish gray clay with sand
Remarks: System X

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.125	0.006054	0.829	0.605	0.894	2.73e-005	4.84e-002	3.56e-003	
2	0.250	0.009641	0.822	0.964	3.729	6.48e-006	2.87e-002	5.01e-004	
3	0.500	0.01574	0.811	1.57	3.744	6.39e-006	2.44e-002	4.20e-004	
4	1.00	0.02519	0.794	2.52	3.352	7.02e-006	1.89e-002	3.58e-004	
5	2.00	0.03521	0.775	3.52	2.946	7.83e-006	1.00e-002	2.12e-004	
6	4.00	0.05705	0.735	5.70	10.640	2.10e-006	1.09e-002	6.18e-005	
7	8.00	0.1020	0.652	10.2	6.208	3.35e-006	1.12e-002	1.02e-004	
8	16.0	0.1501	0.564	15.0	5.013	3.74e-006	6.01e-003	6.06e-005	
9	12.0	0.1492	0.566	14.9	0.880	2.02e-005	2.44e-004	1.33e-005	
10	8.00	0.1462	0.571	14.6	1.004	1.78e-005	7.45e-004	3.57e-005	
11	4.00	0.1397	0.583	14.0	2.292	7.86e-006	1.63e-003	3.46e-005	
12	8.00	0.1452	0.573	14.5	1.438	1.26e-005	1.37e-003	4.65e-005	
13	12.0	0.1494	0.565	14.9	2.670	6.68e-006	1.07e-003	1.92e-005	
14	16.0	0.1549	0.555	15.5	6.825	2.58e-006	1.38e-003	9.61e-006	

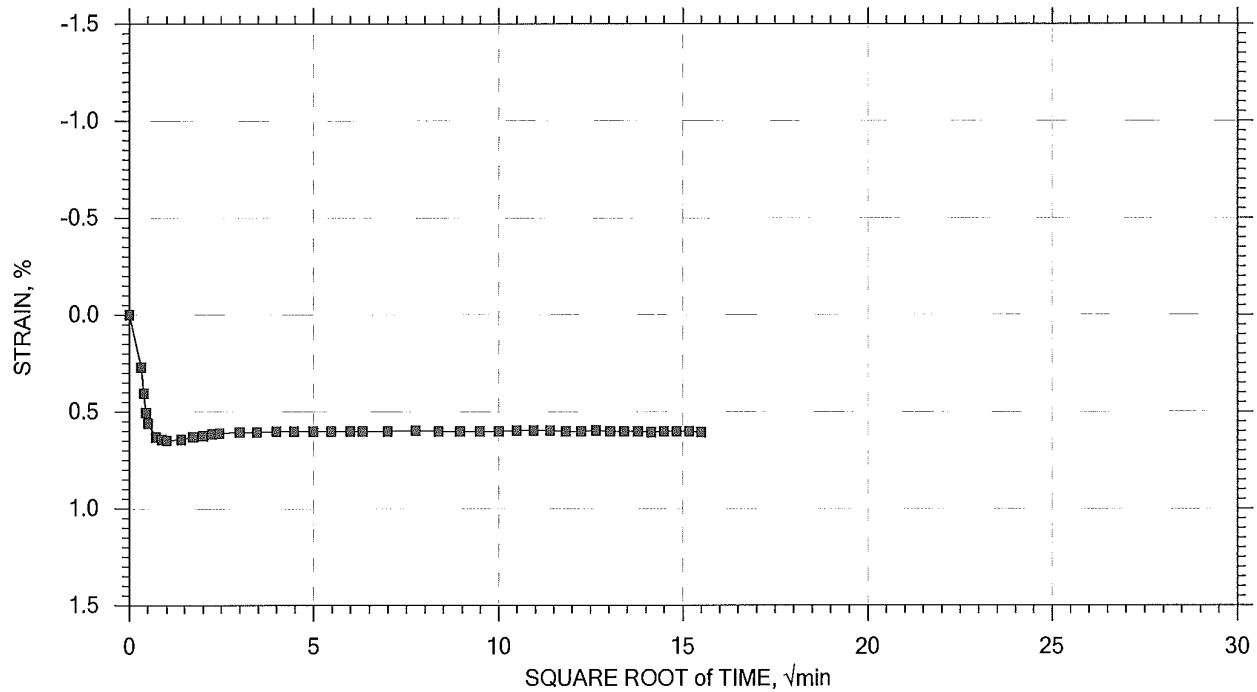
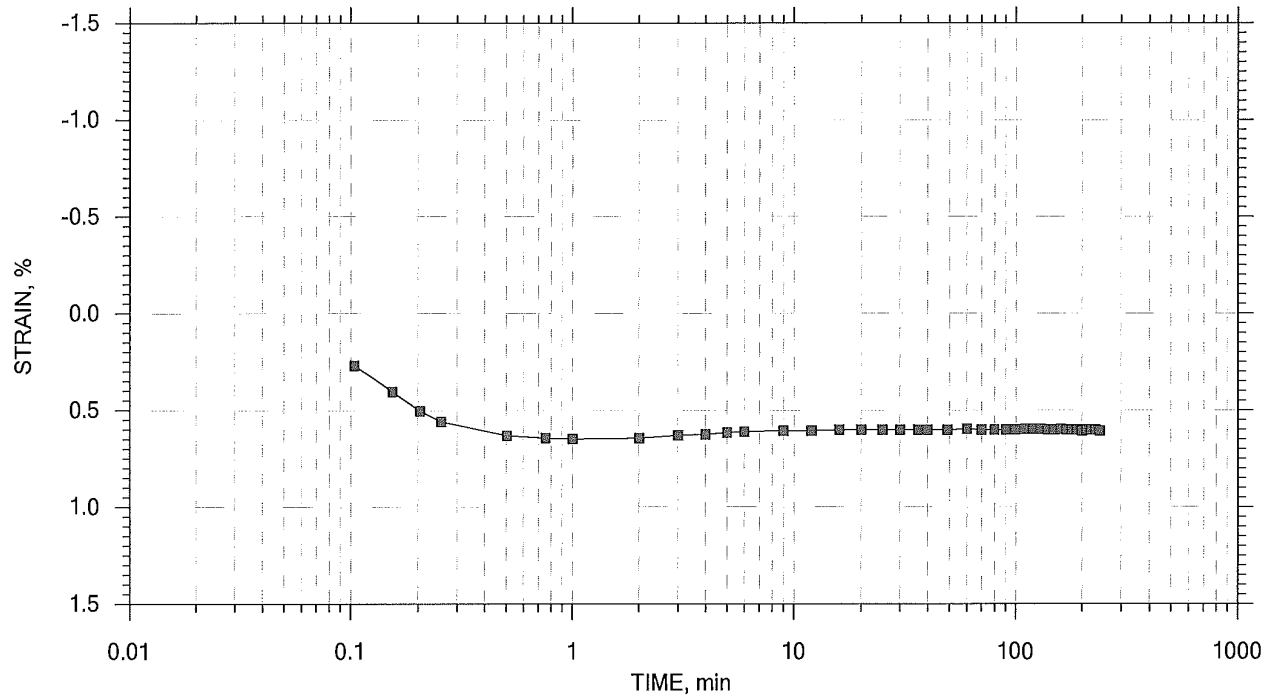
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.125	0.006054	0.829	0.605	0.000	0.00e+000	4.84e-002	0.00e+000	0.00e+000
2	0.250	0.009641	0.822	0.964	0.000	0.00e+000	2.87e-002	0.00e+000	0.00e+000
3	0.500	0.01574	0.811	1.57	0.526	1.06e-005	2.44e-002	6.95e-004	0.00e+000
4	1.00	0.02519	0.794	2.52	0.000	0.00e+000	1.89e-002	0.00e+000	0.00e+000
5	2.00	0.03521	0.775	3.52	0.000	0.00e+000	1.00e-002	0.00e+000	0.00e+000
6	4.00	0.05705	0.735	5.70	0.000	0.00e+000	1.09e-002	0.00e+000	0.00e+000
7	8.00	0.1020	0.652	10.2	1.620	2.98e-006	1.12e-002	9.04e-005	0.00e+000
8	16.0	0.1501	0.564	15.0	1.626	2.68e-006	6.01e-003	4.34e-005	0.00e+000
9	12.0	0.1492	0.566	14.9	0.000	0.00e+000	2.44e-004	0.00e+000	0.00e+000
10	8.00	0.1462	0.571	14.6	0.145	2.85e-005	7.45e-004	5.72e-005	0.00e+000
11	4.00	0.1397	0.583	14.0	0.000	0.00e+000	1.63e-003	0.00e+000	0.00e+000
12	8.00	0.1452	0.573	14.5	0.335	1.25e-005	1.37e-003	4.63e-005	0.00e+000
13	12.0	0.1494	0.565	14.9	0.197	2.10e-005	1.07e-003	6.04e-005	0.00e+000
14	16.0	0.1549	0.555	15.5	0.000	0.00e+000	1.38e-003	0.00e+000	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 14

Stress: 0.125 tsf



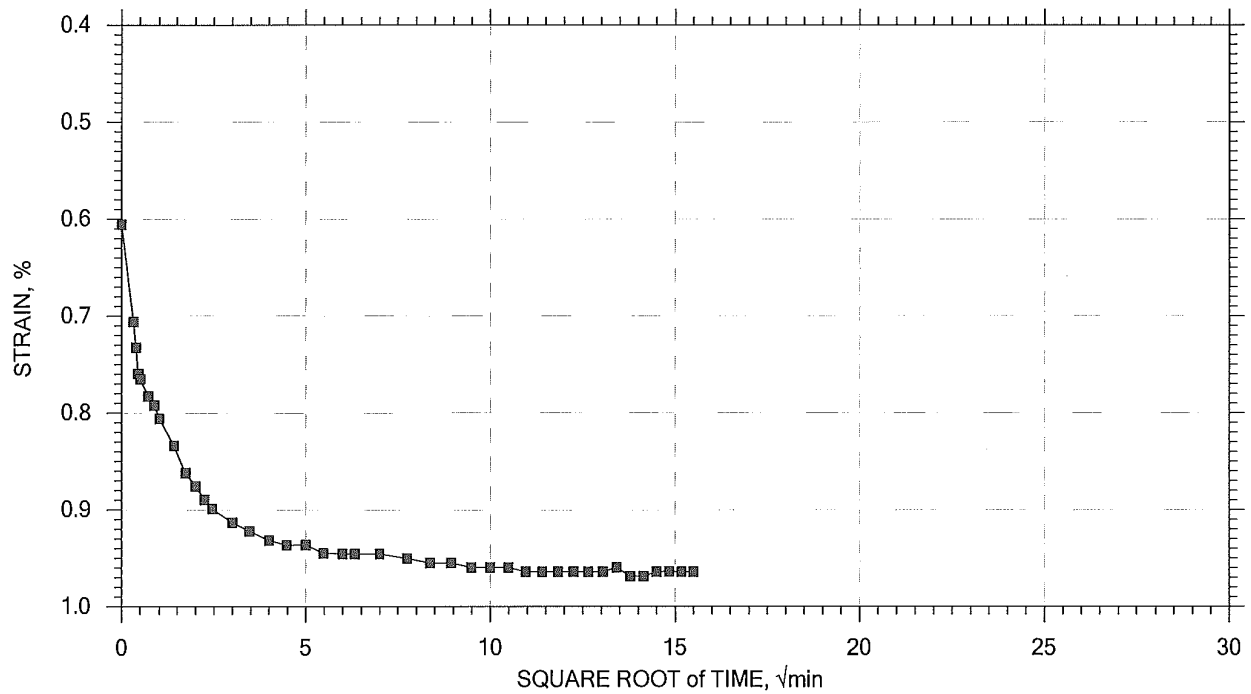
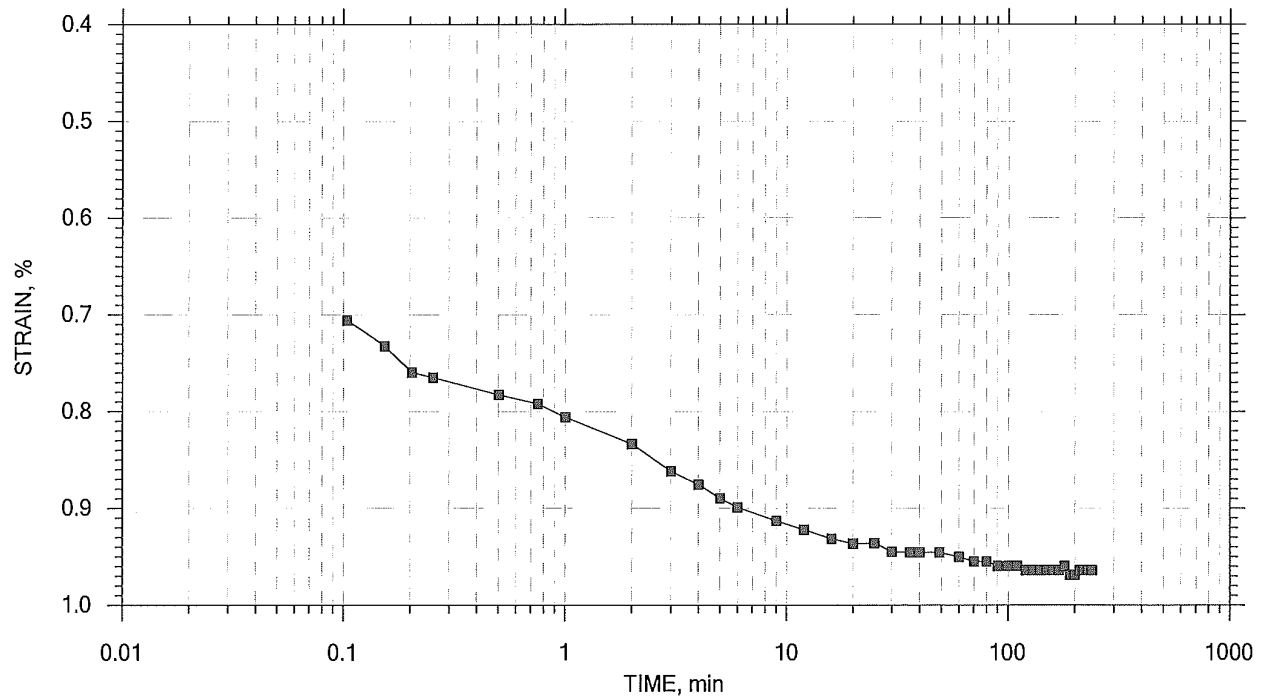
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 14

Stress: 0.25 tsf



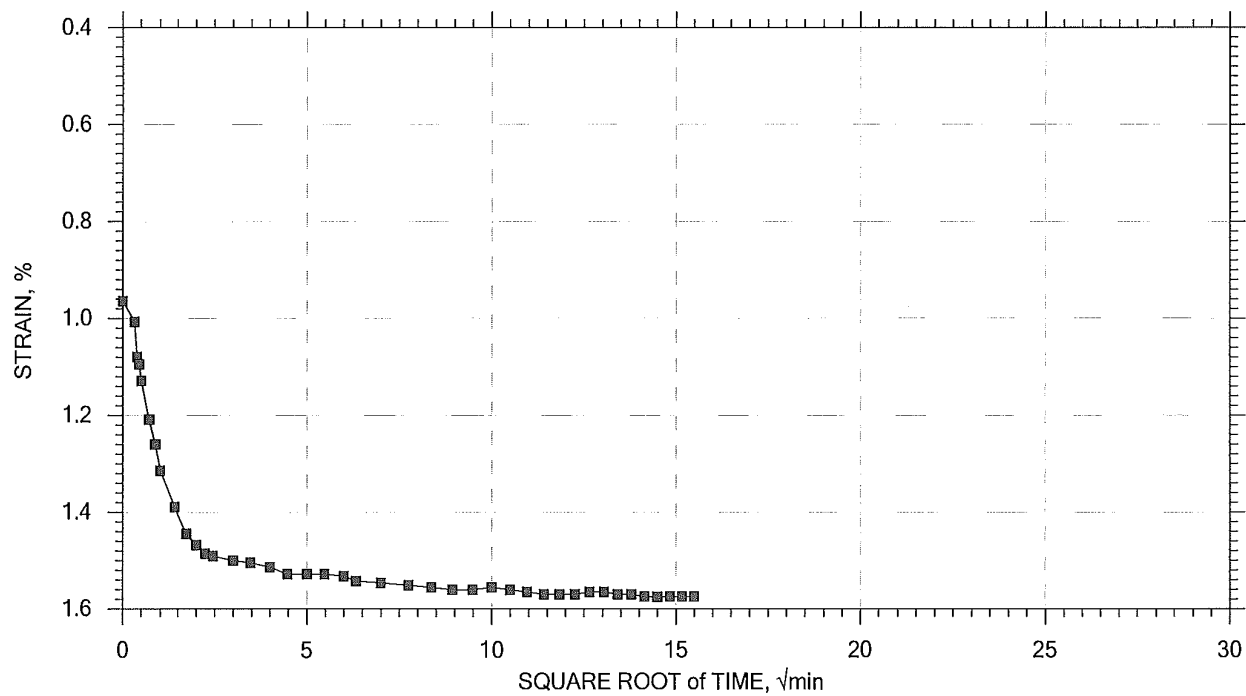
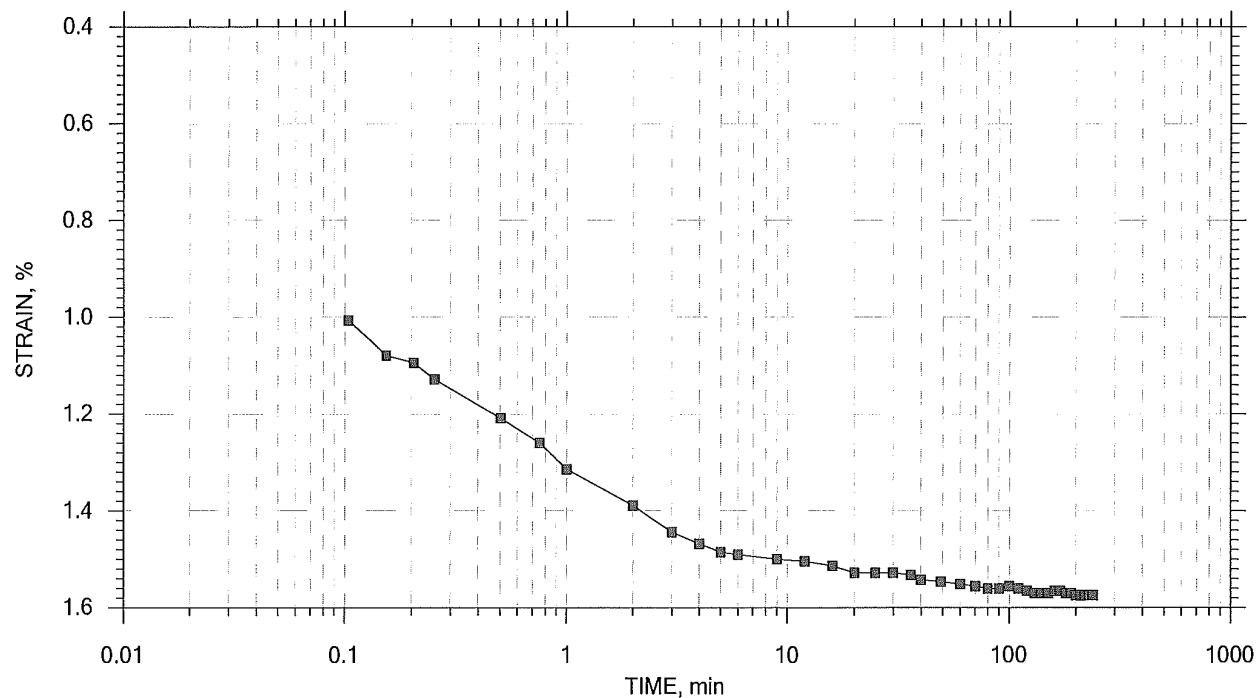
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 14

Stress: 0.5 tsf



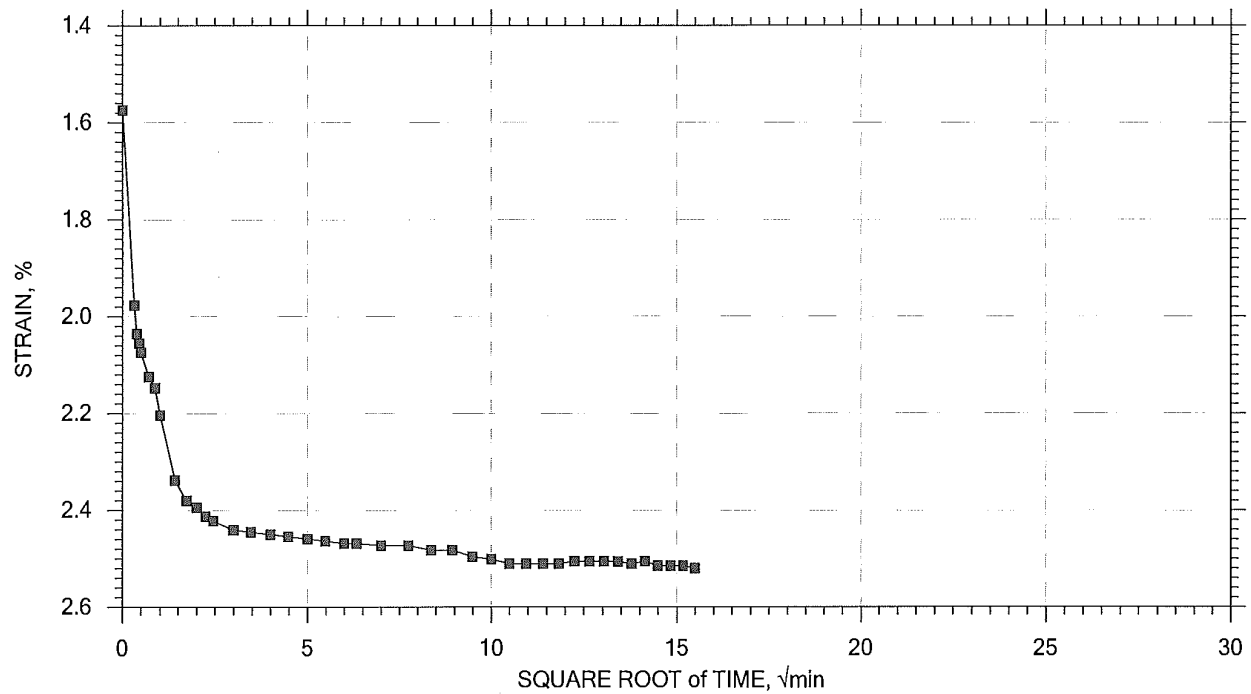
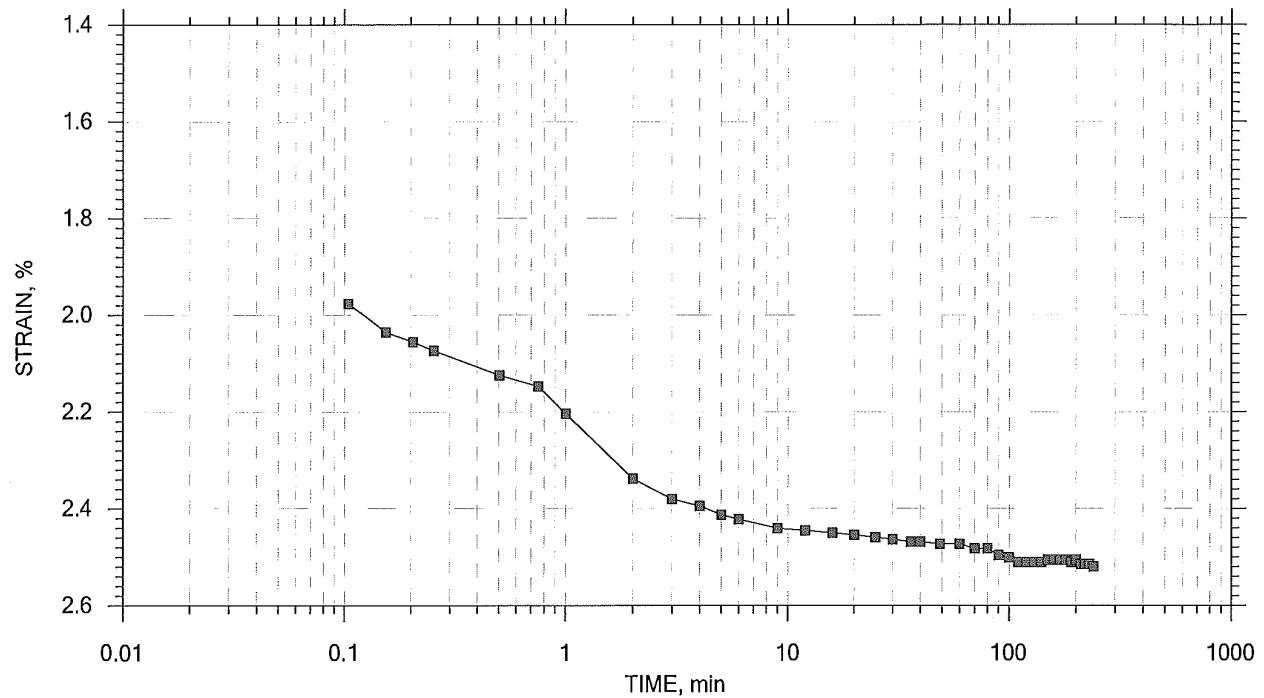
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 14

Stress: 1 tsf



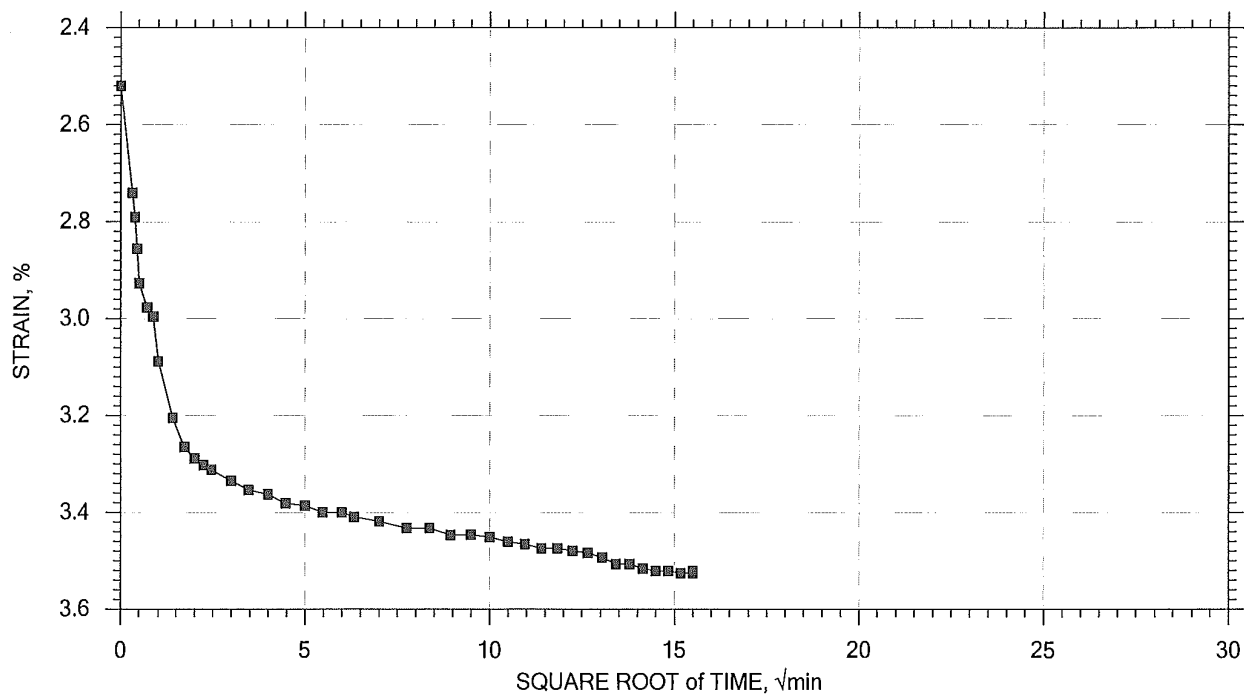
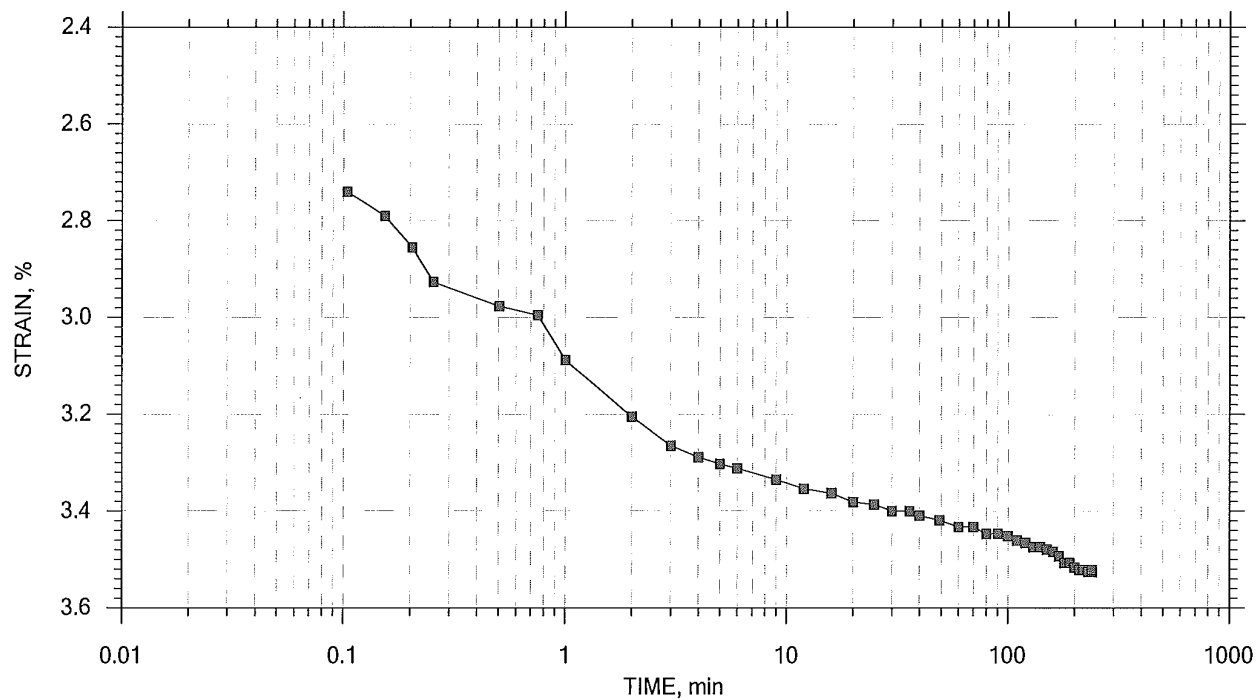
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 14

Stress: 2 tsf



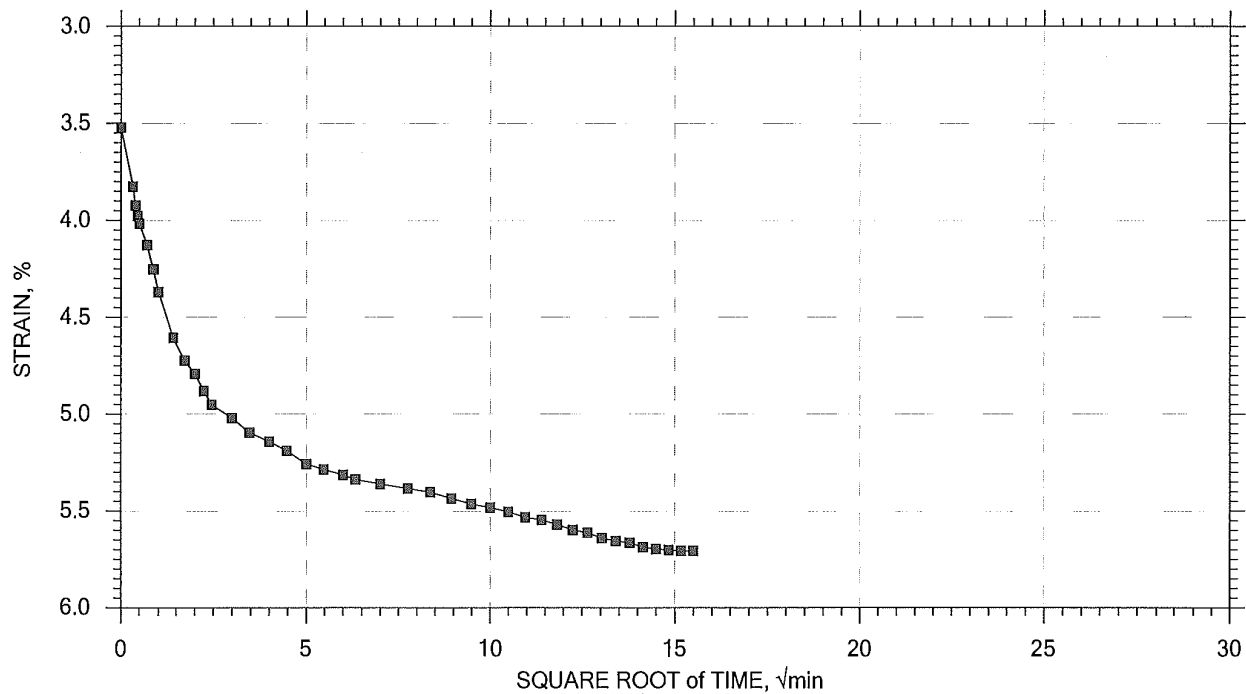
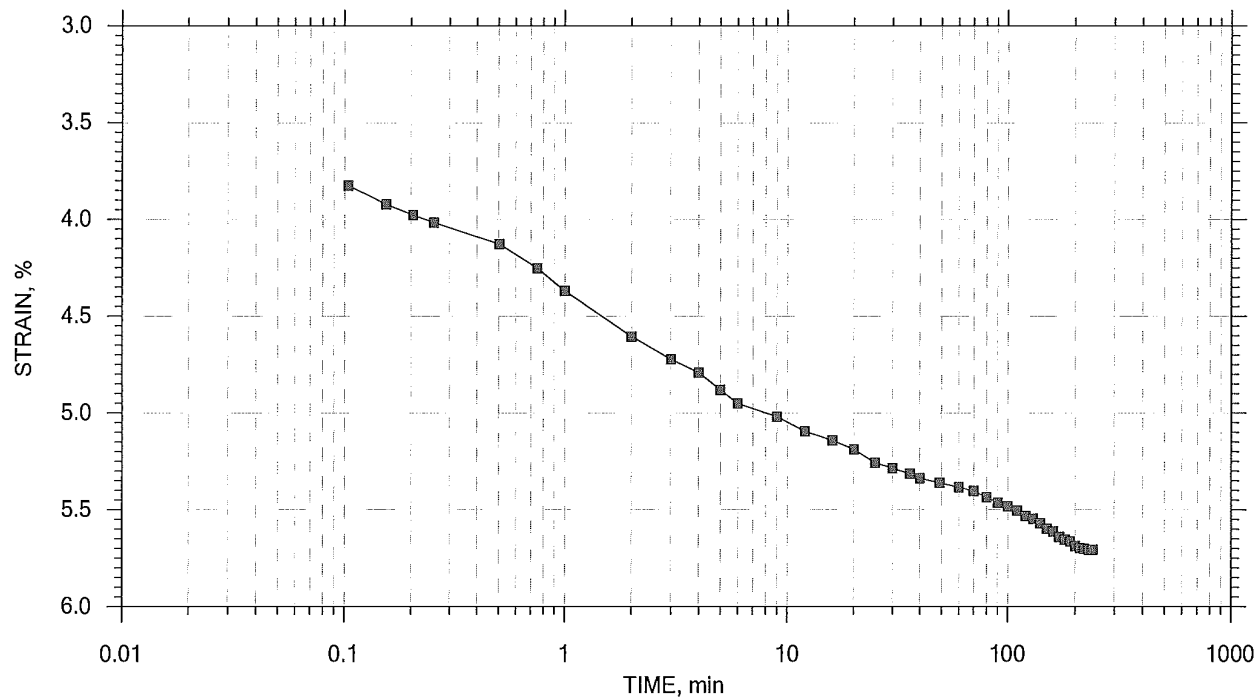
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 14

Stress: 4 tsf



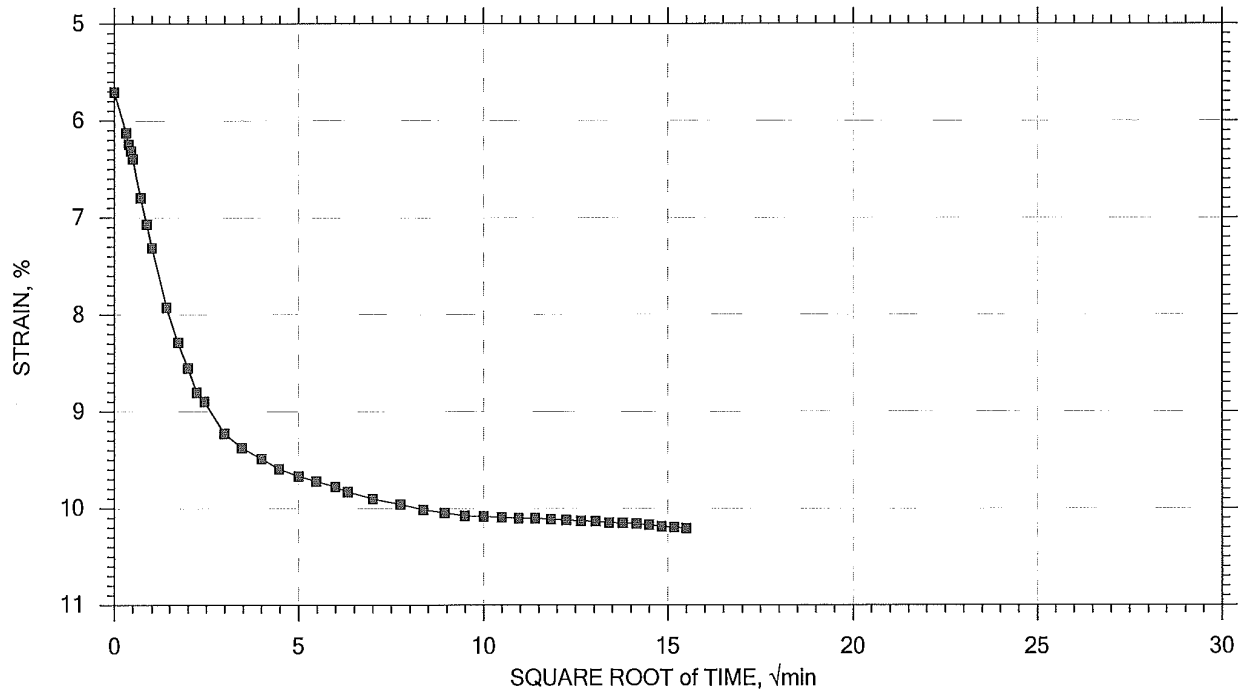
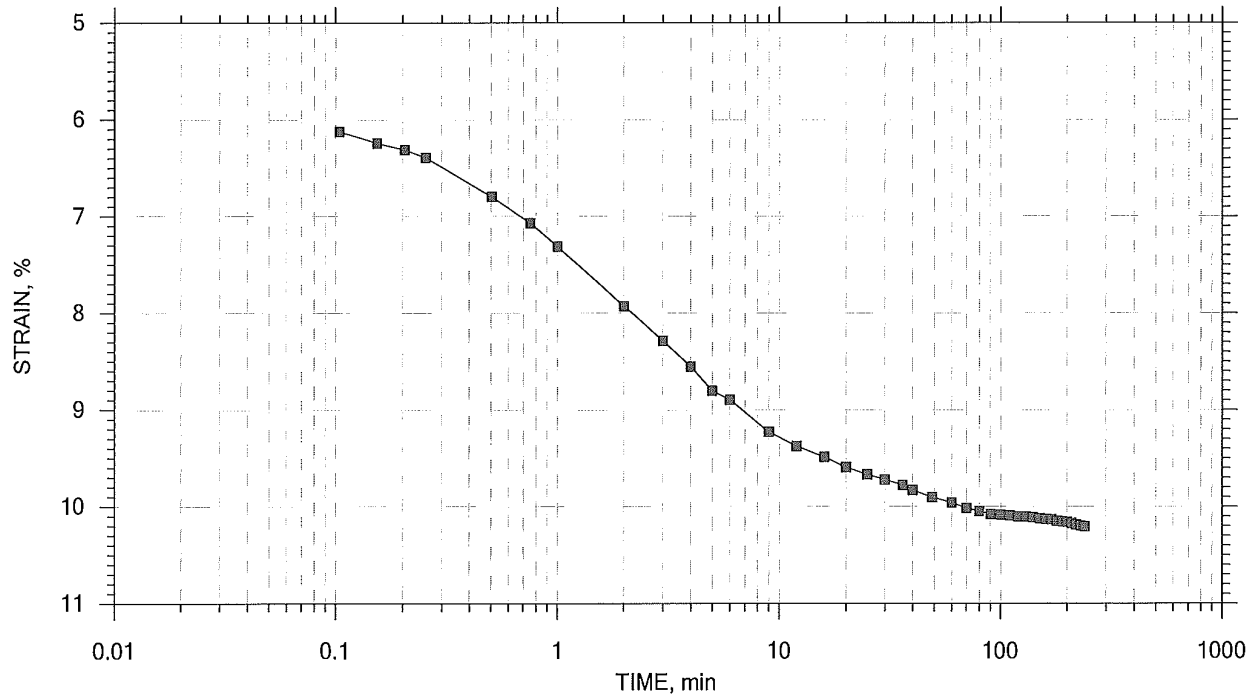
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 14

Stress: 8 tsf



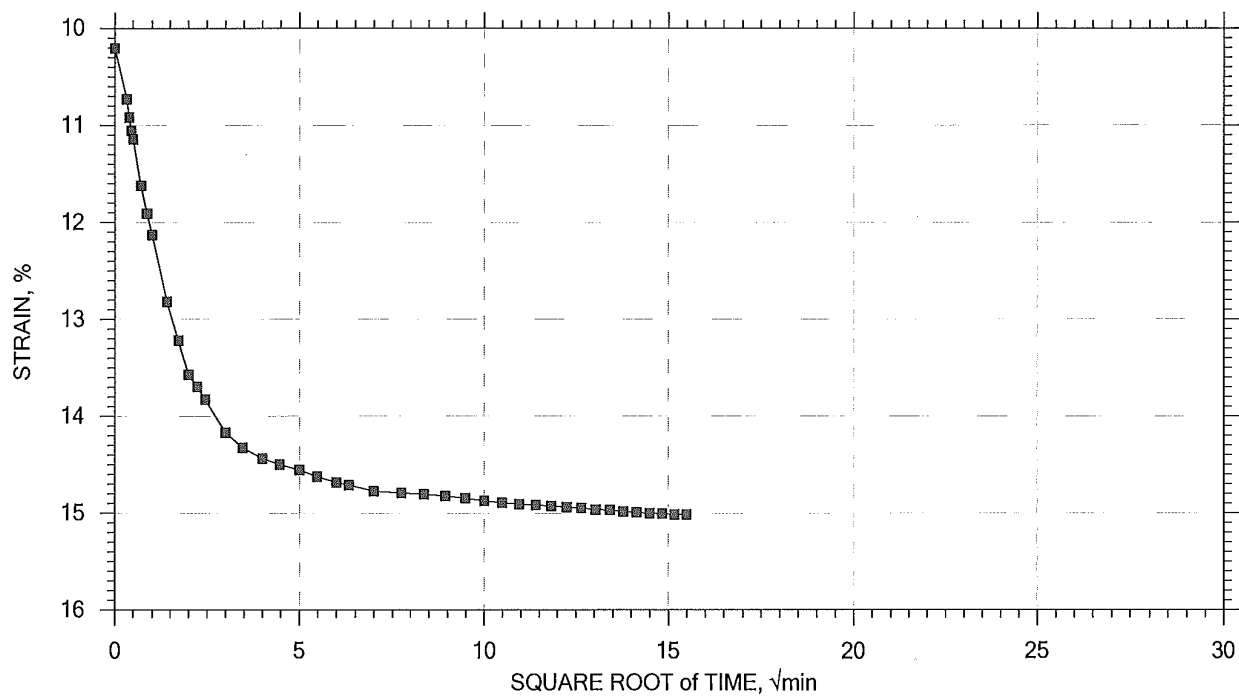
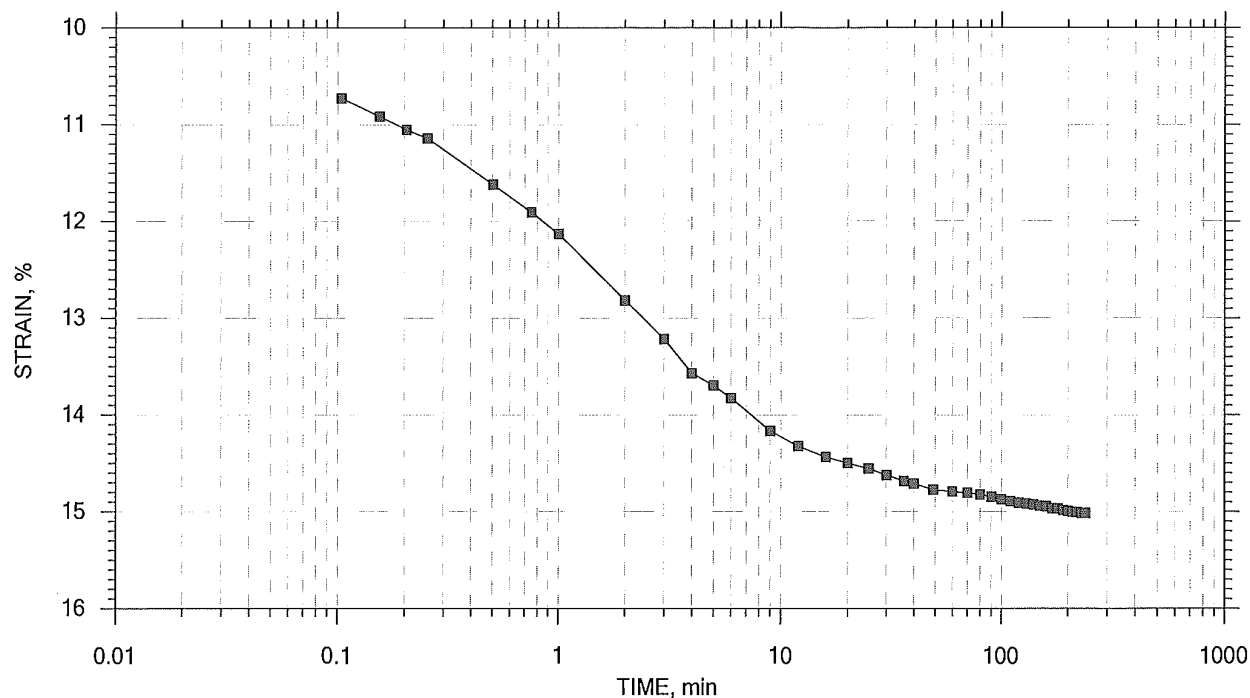
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 14

Stress: 16 tsf



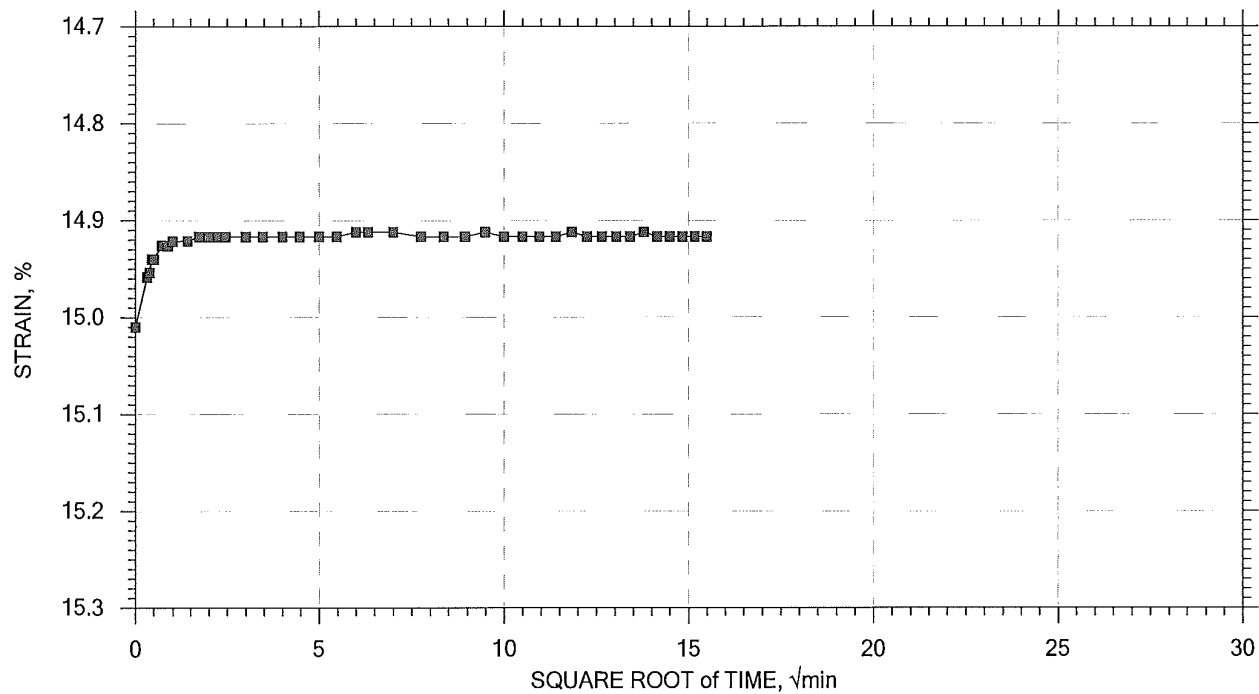
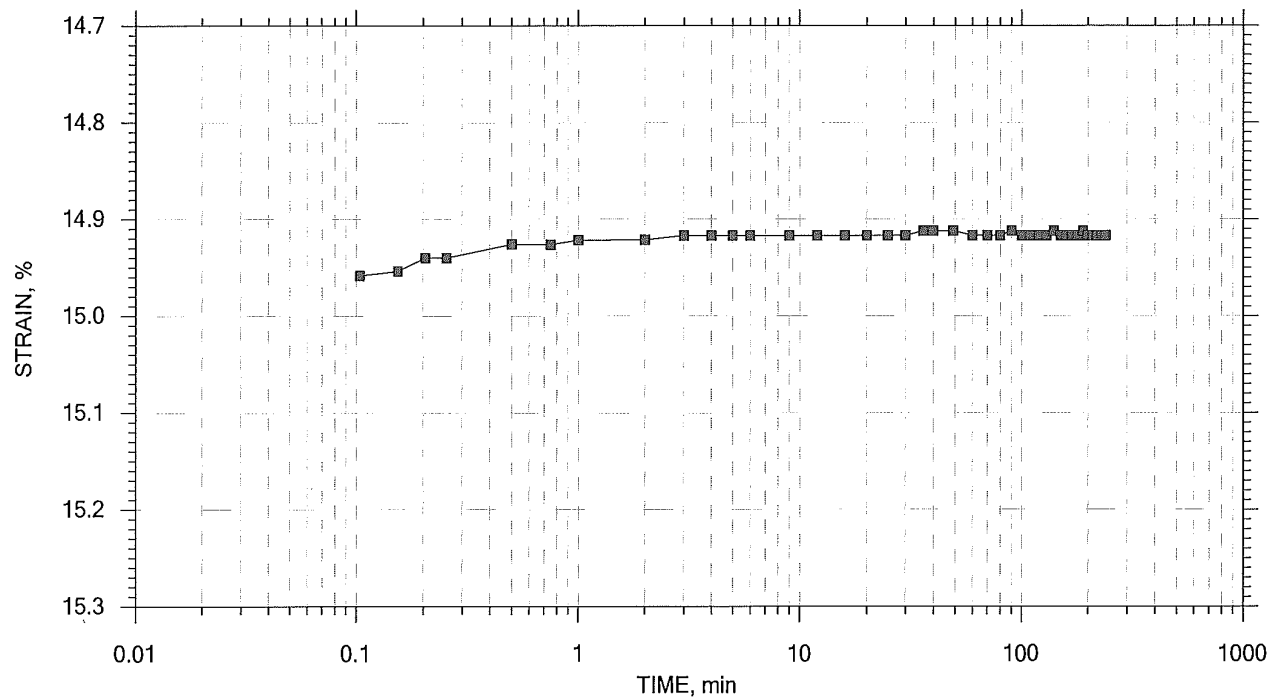
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 14

Stress: 12 tsf



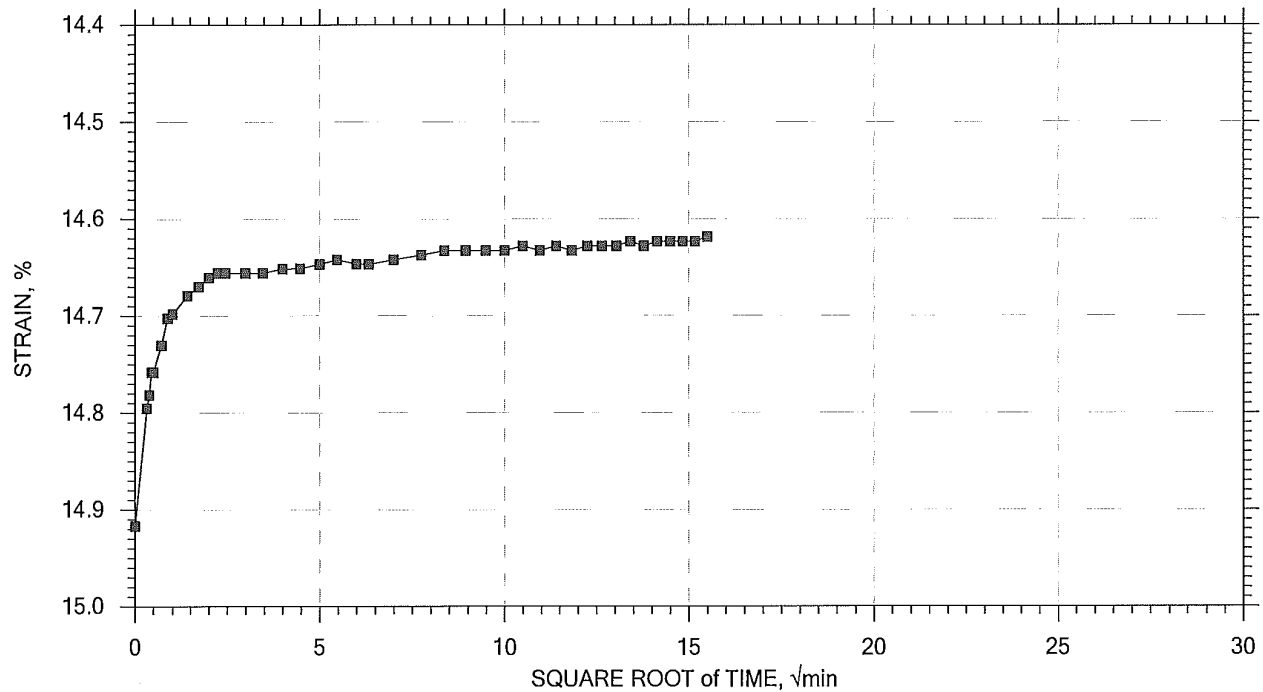
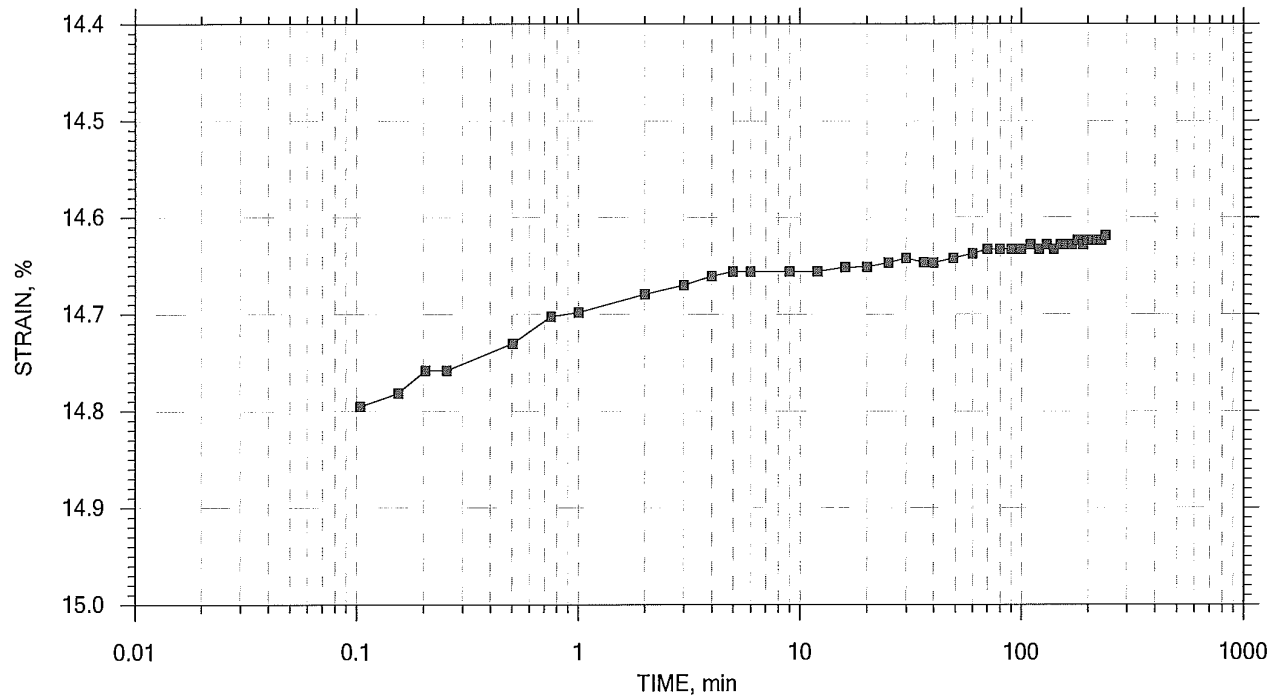
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 14

Stress: 8 tsf



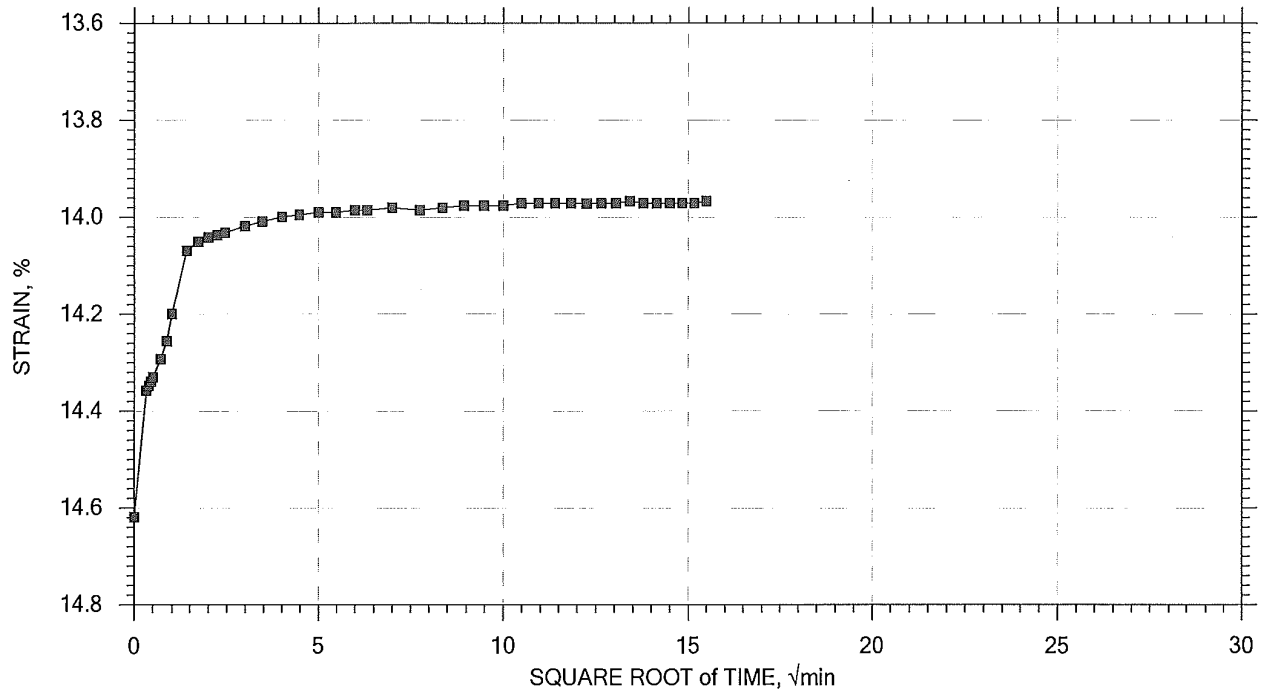
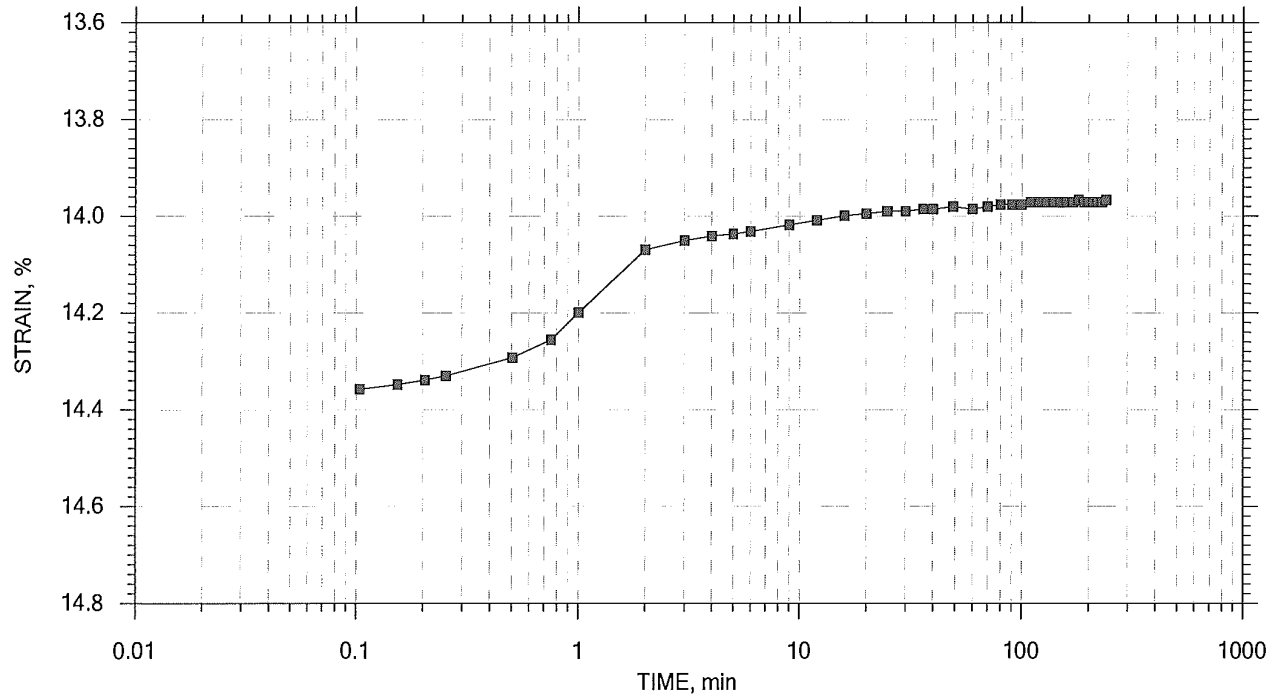
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 14

Stress: 4 tsf



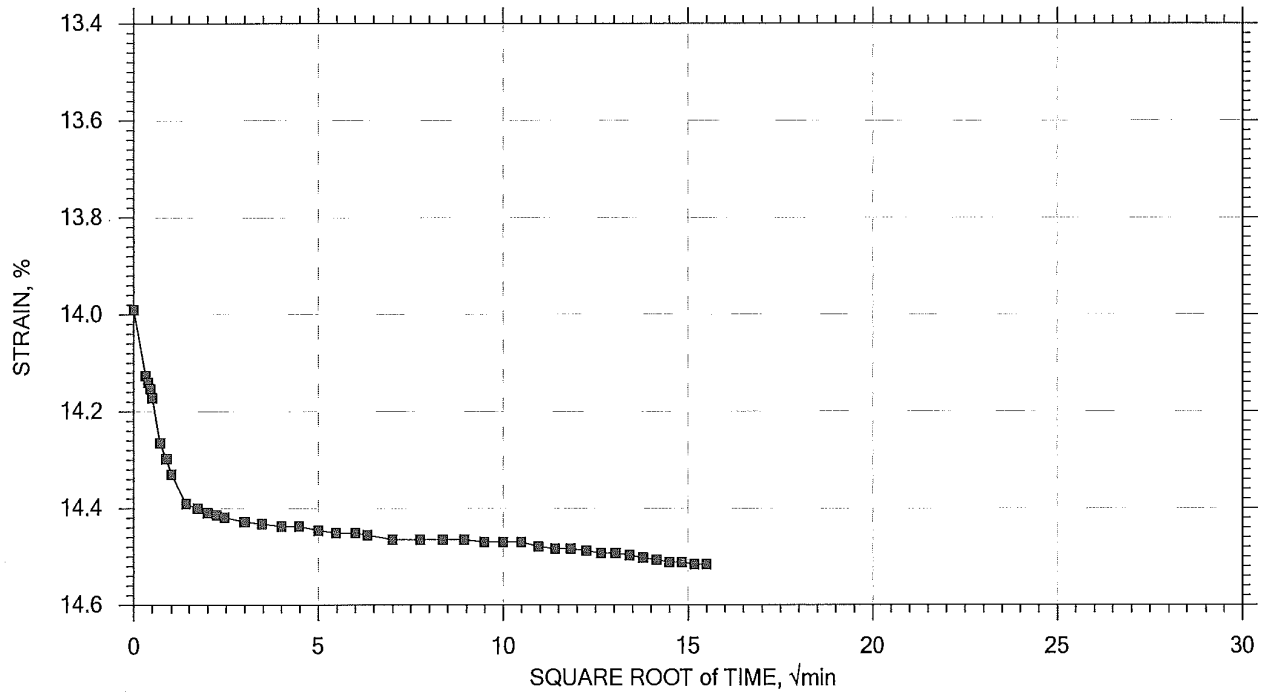
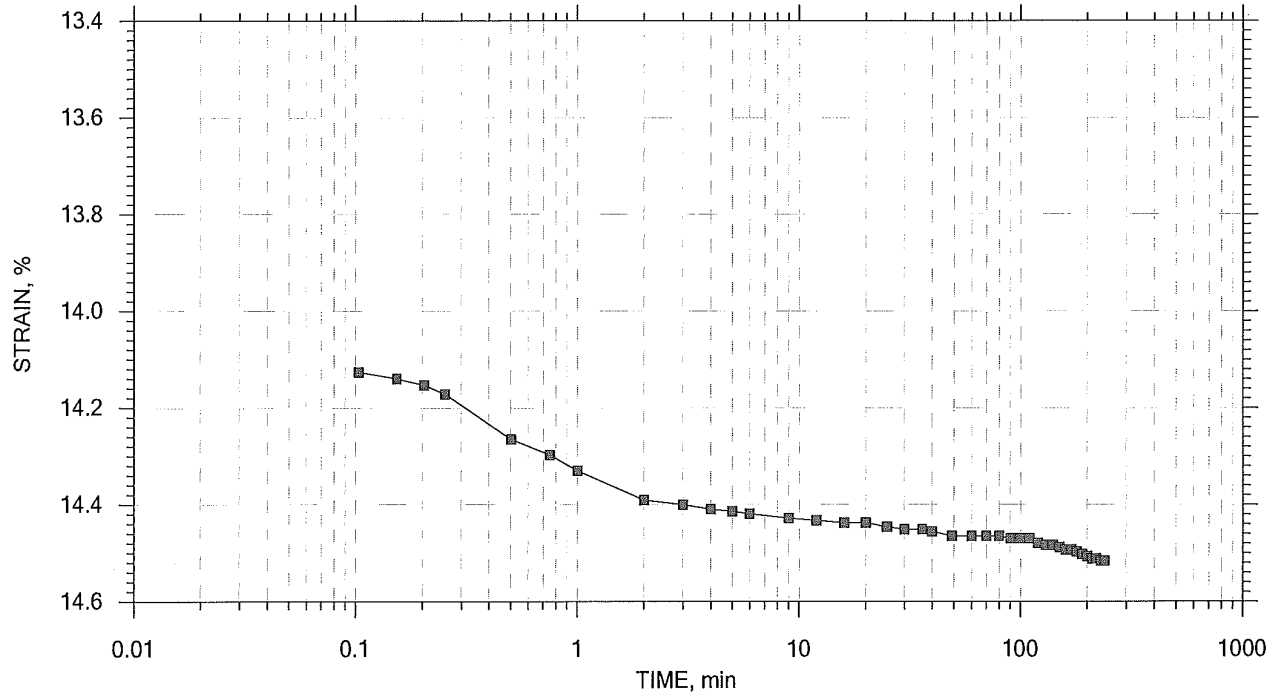
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 14

Stress: 8 tsf



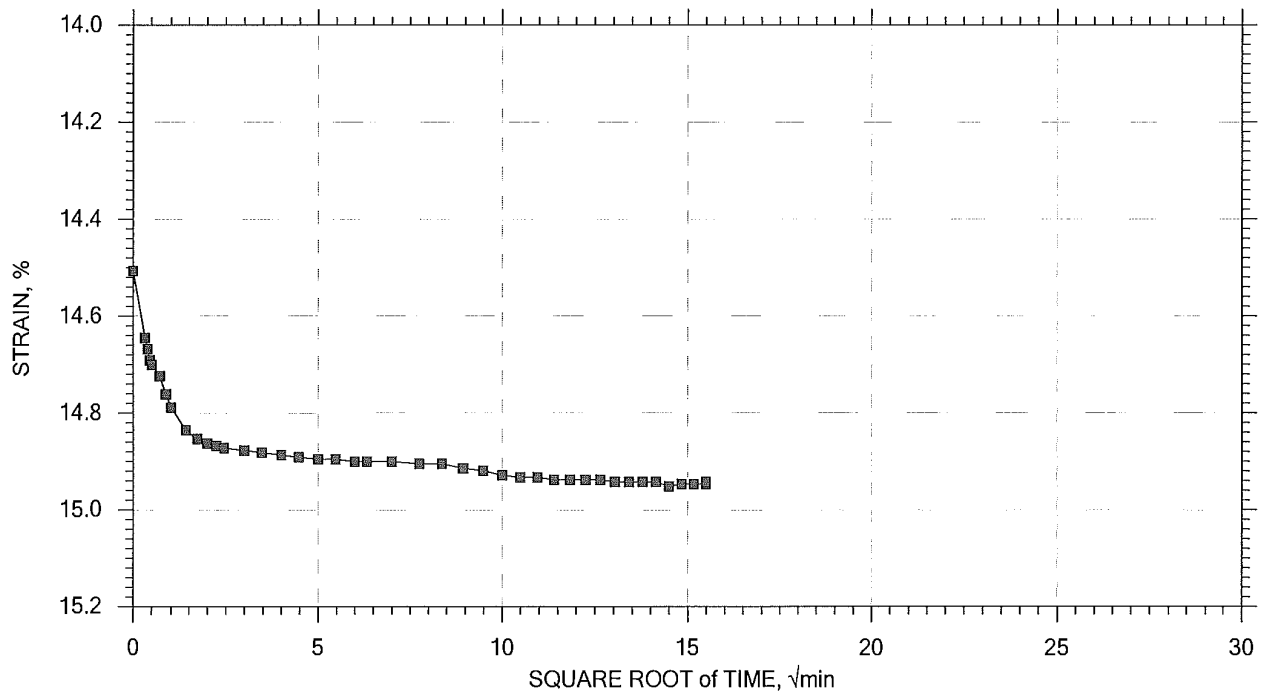
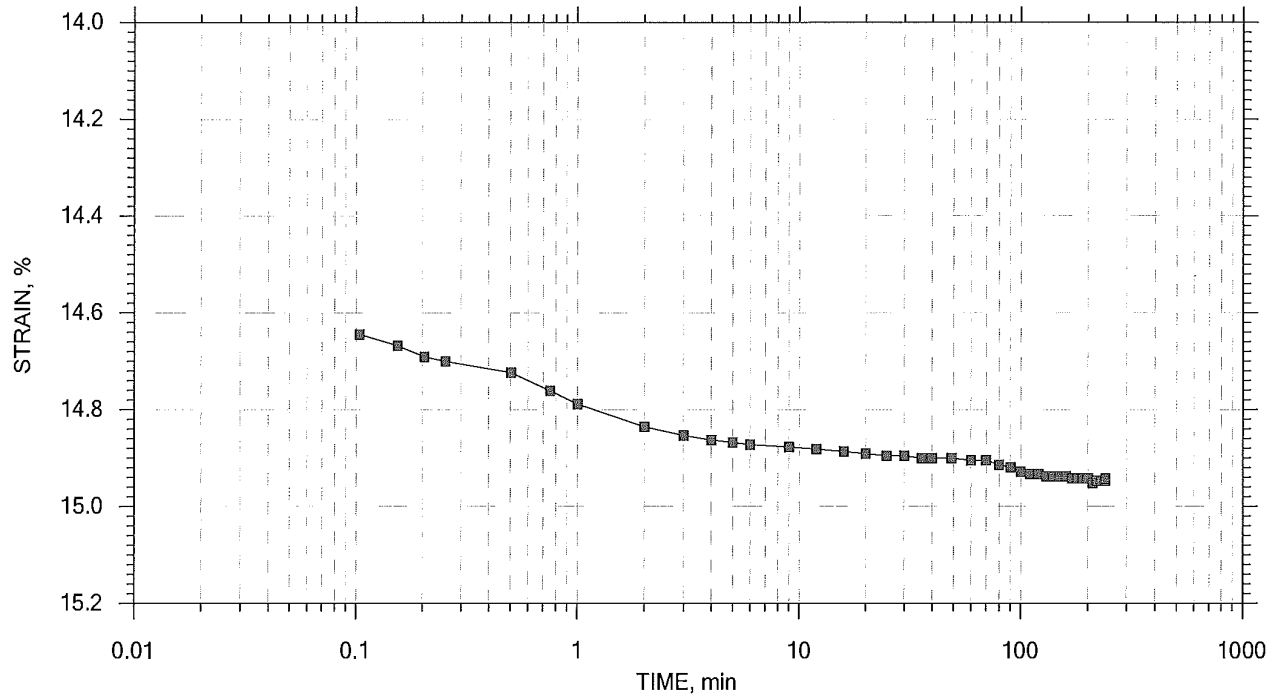
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 14

Stress: 12 tsf



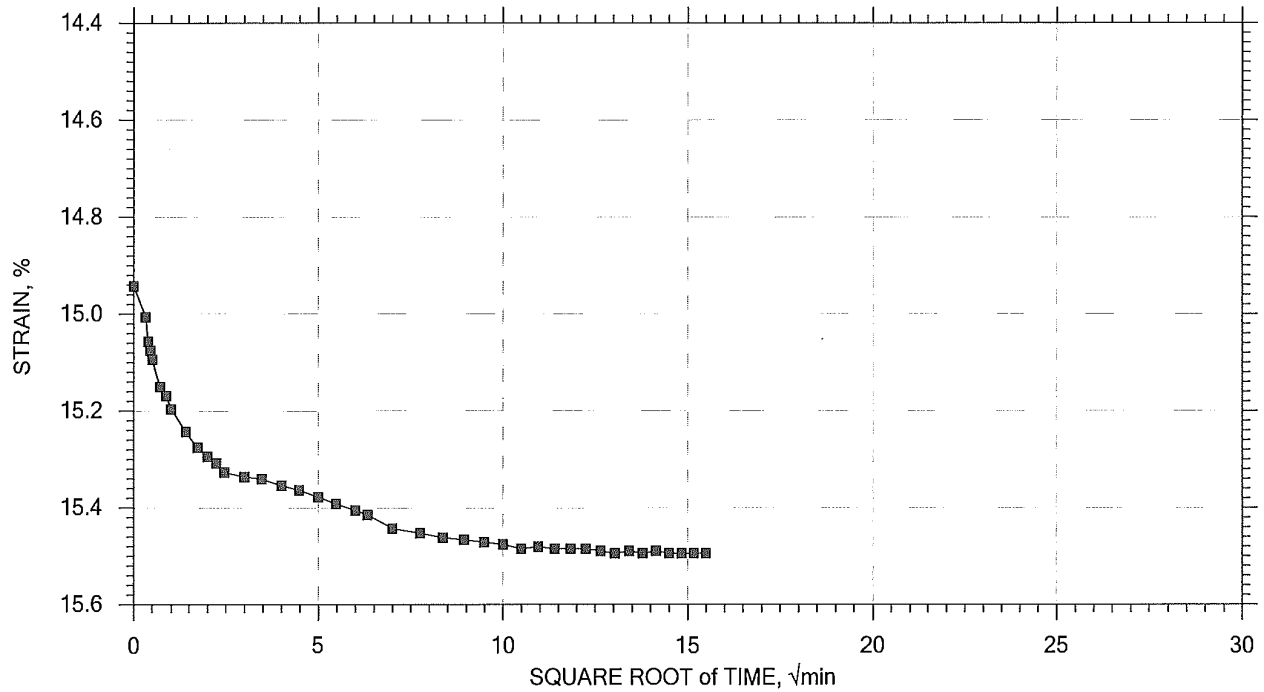
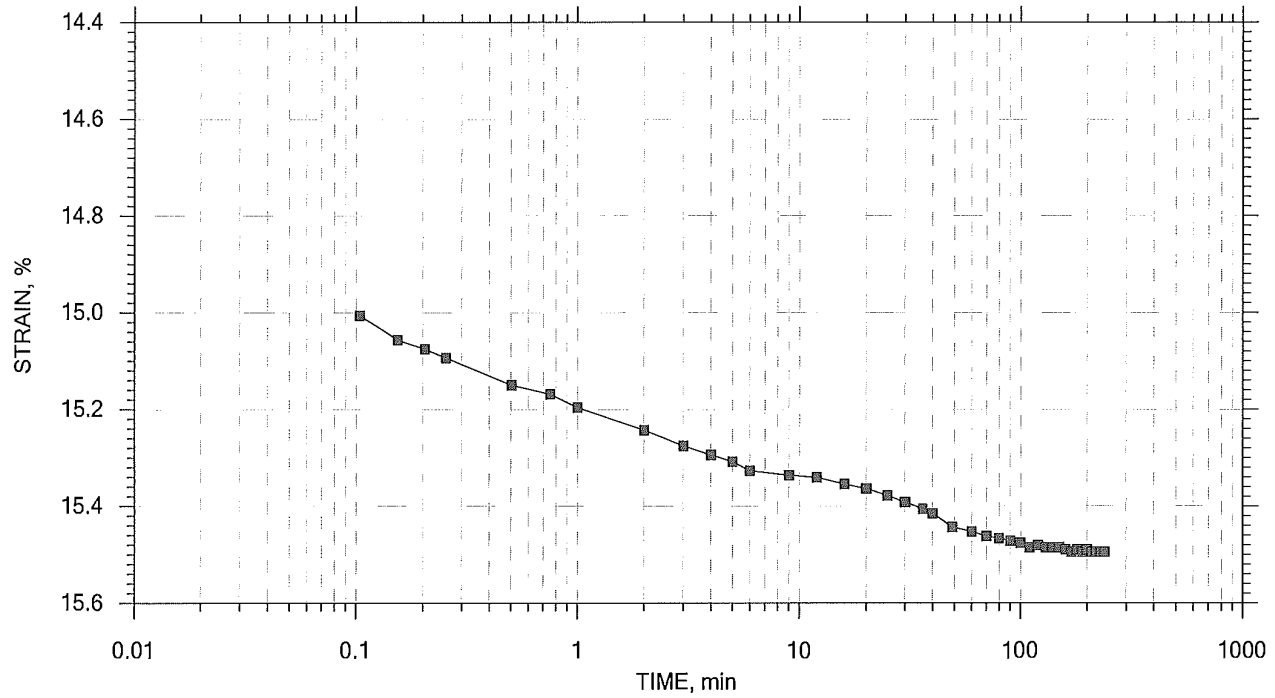
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 14 of 14

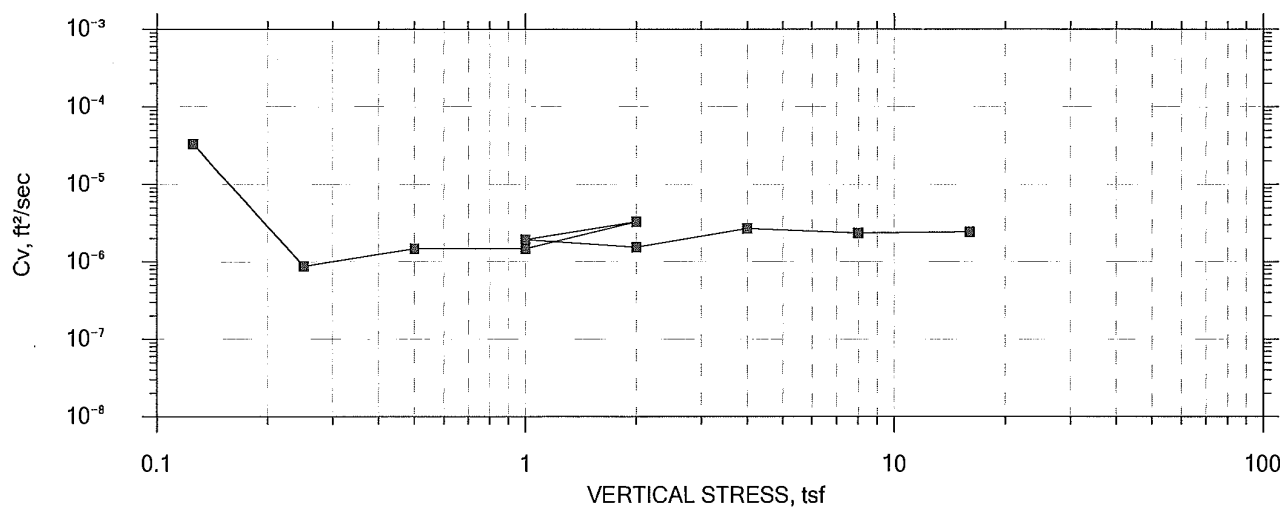
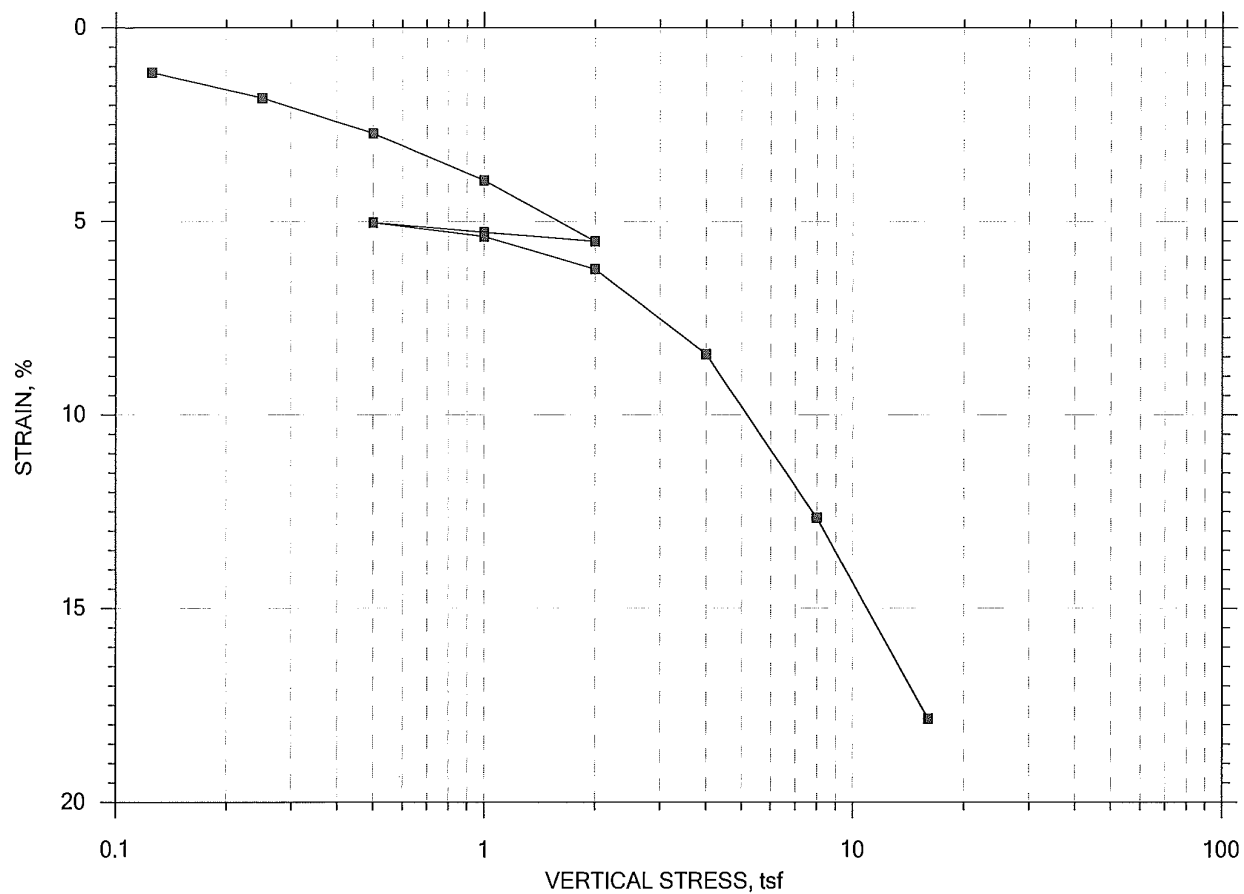
Stress: 16 tsf




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-47	Tested By: md	Checked By: jdt
	Sample No.: OT-9	Test Date: 12/19/13	Test No.: IP-2
	Depth: 79-81 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System X		

One-Dimensional Consolidation by ASTM D2435 - Method B

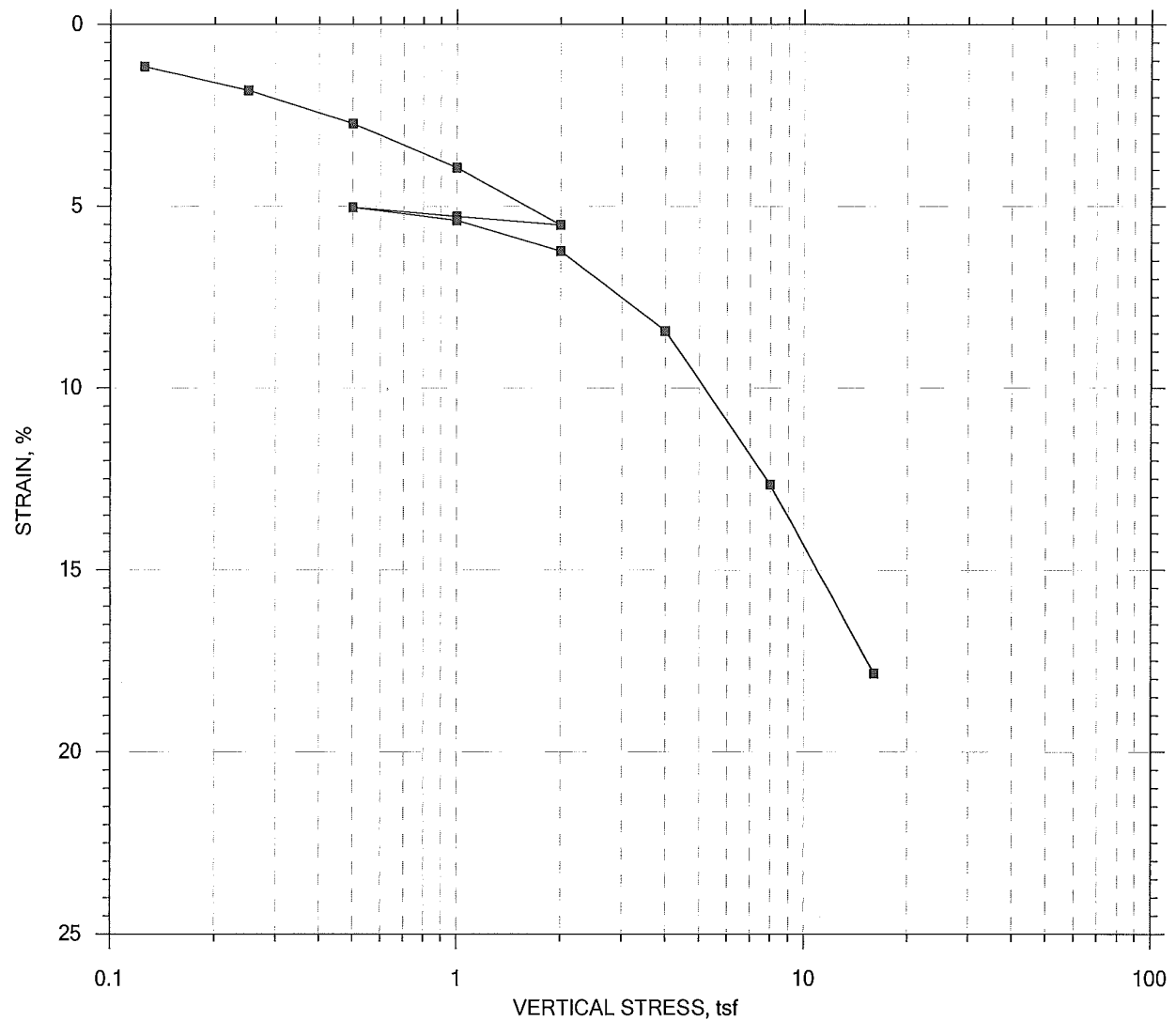
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test
Current Vertical Effective Stress: ---			Water Content, %	35.91	26.22
Preconsolidation Stress: ---			Dry Unit Weight, pcf	85.881	99.861
Compression Ratio: ---			Saturation, %	98.68	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.00
LL: ---	PL: ---	PI: ---	GS: 2.75		

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-50
Sample No.: OT-1
Test No.: IP-5

Location: Chelsea, MA
Tested By: md
Test Date: 01/10/14
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 19-21 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System S

Estimated Specific Gravity: 2.75
Initial Void Ratio: 1.00
Final Void Ratio: 0.722

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.86 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	11869	RING		11964
Wt. Container + Wet Soil, gm	163.60	260.40	249.67	143.88
Wt. Container + Dry Soil, gm	116.67	220.66	220.66	115.59
Wt. Container, gm	7.5500	110.00	110.00	7.6800
Wt. Dry Soil, gm	109.12	110.66	110.66	107.91
Water Content, %	43.01	35.91	26.22	26.22
Void Ratio	---	1.00	0.722	---
Degree of Saturation, %	---	98.68	100.00	---
Dry Unit Weight, pcf	---	85.881	99.861	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-50
Sample No.: OT-1
Test No.: IP-5

Location: Chelsea, MA
Tested By: md
Test Date: 01/10/14
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 19-21 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System S

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.125	0.01153	0.980	1.15	0.958	2.53e-005	9.22e-002	6.30e-003	
2	0.250	0.01807	0.966	1.81	20.678	1.15e-006	5.23e-002	1.62e-004	
3	0.500	0.02720	0.948	2.72	17.830	1.31e-006	3.65e-002	1.29e-004	
4	1.00	0.03933	0.924	3.93	11.342	2.02e-006	2.43e-002	1.32e-004	
5	2.00	0.05514	0.892	5.51	5.938	3.75e-006	1.58e-002	1.60e-004	
6	1.00	0.05275	0.897	5.28	7.030	3.12e-006	2.39e-003	2.01e-005	
7	0.500	0.05030	0.902	5.03	0.000	0.00e+000	4.90e-003	0.00e+000	
8	1.00	0.05385	0.895	5.38	12.798	1.72e-006	7.10e-003	3.30e-005	
9	2.00	0.06233	0.878	6.23	14.064	1.55e-006	8.48e-003	3.54e-005	
10	4.00	0.08429	0.834	8.43	8.205	2.57e-006	1.10e-002	7.60e-005	
11	8.00	0.1266	0.749	12.7	7.929	2.48e-006	1.06e-002	7.06e-005	
12	16.0	0.1784	0.645	17.8	5.465	3.22e-006	6.48e-003	5.64e-005	

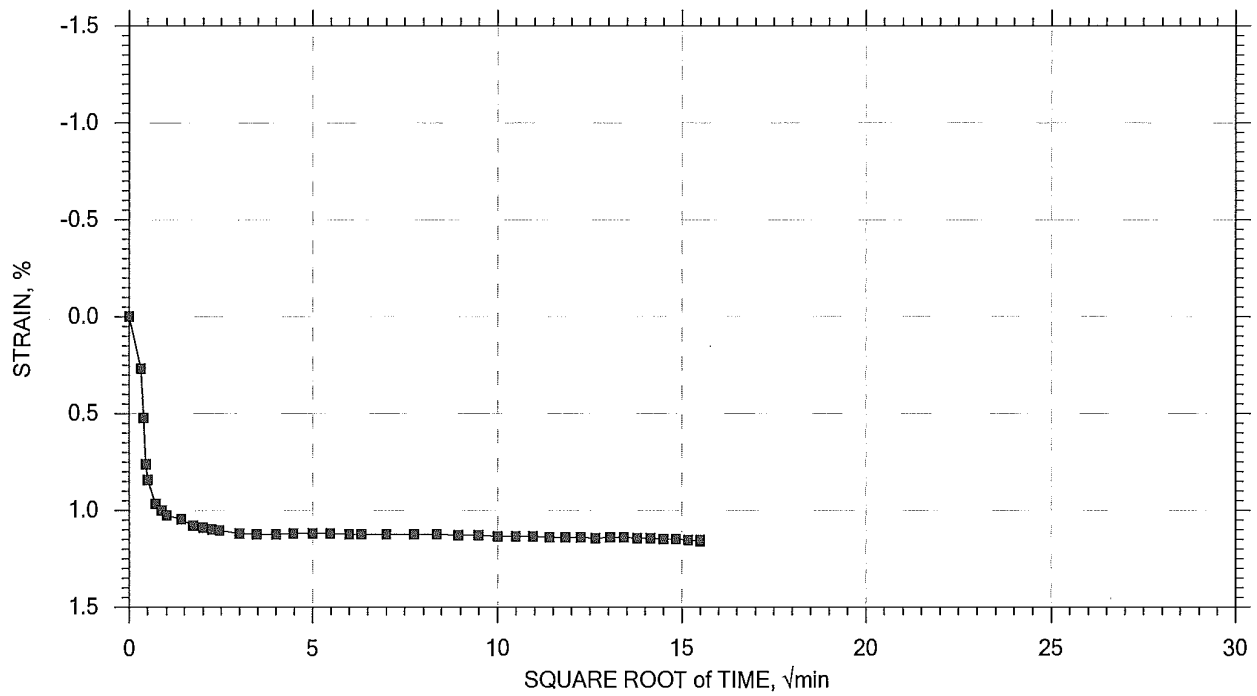
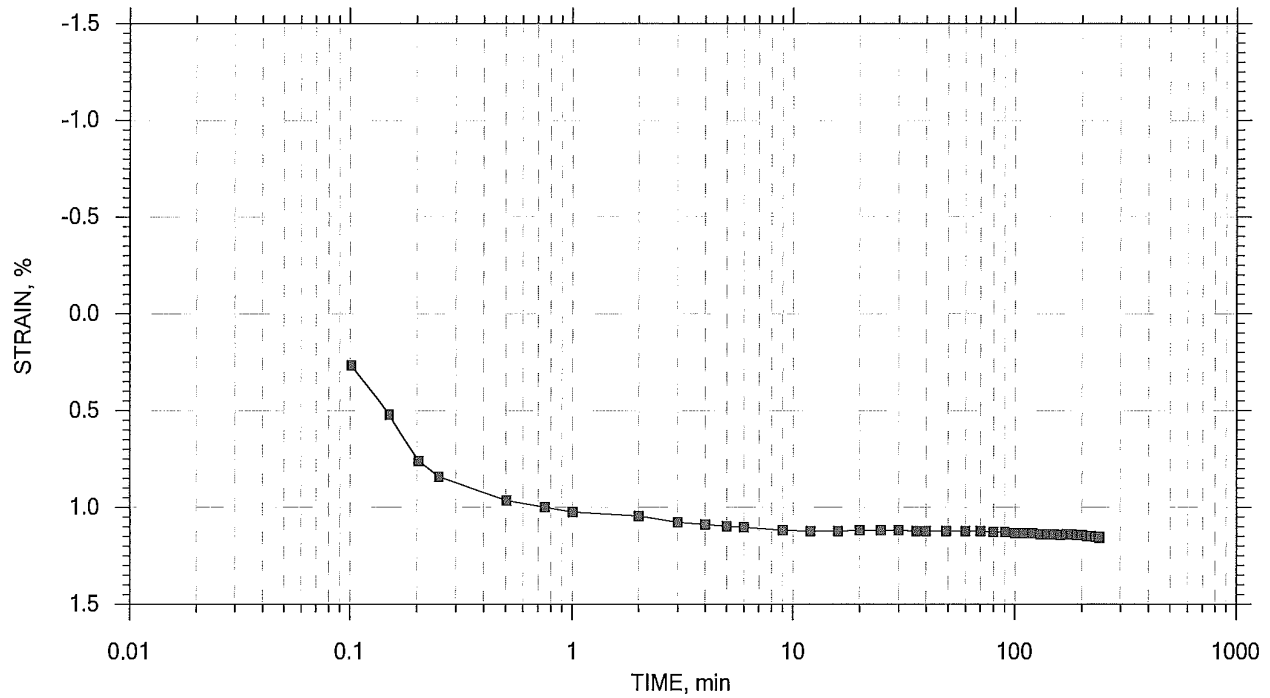
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.125	0.01153	0.980	1.15	0.000	0.00e+000	9.22e-002	0.00e+000	0.00e+000
2	0.250	0.01807	0.966	1.81	0.000	0.00e+000	5.23e-002	0.00e+000	0.00e+000
3	0.500	0.02720	0.948	2.72	0.000	0.00e+000	3.65e-002	0.00e+000	0.00e+000
4	1.00	0.03933	0.924	3.93	4.219	1.26e-006	2.43e-002	8.26e-005	0.00e+000
5	2.00	0.05514	0.892	5.51	1.782	2.90e-006	1.58e-002	1.24e-004	0.00e+000
6	1.00	0.05275	0.897	5.28	0.000	0.00e+000	2.39e-003	0.00e+000	0.00e+000
7	0.500	0.05030	0.902	5.03	0.000	0.00e+000	4.90e-003	0.00e+000	0.00e+000
8	1.00	0.05385	0.895	5.38	0.000	0.00e+000	7.10e-003	0.00e+000	0.00e+000
9	2.00	0.06233	0.878	6.23	0.000	0.00e+000	8.48e-003	0.00e+000	0.00e+000
10	4.00	0.08429	0.834	8.43	0.000	0.00e+000	1.10e-002	0.00e+000	0.00e+000
11	8.00	0.1266	0.749	12.7	2.105	2.17e-006	1.06e-002	6.18e-005	0.00e+000
12	16.0	0.1784	0.645	17.8	2.096	1.95e-006	6.48e-003	3.41e-005	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 1 of 12

Stress: 0.125 tsf



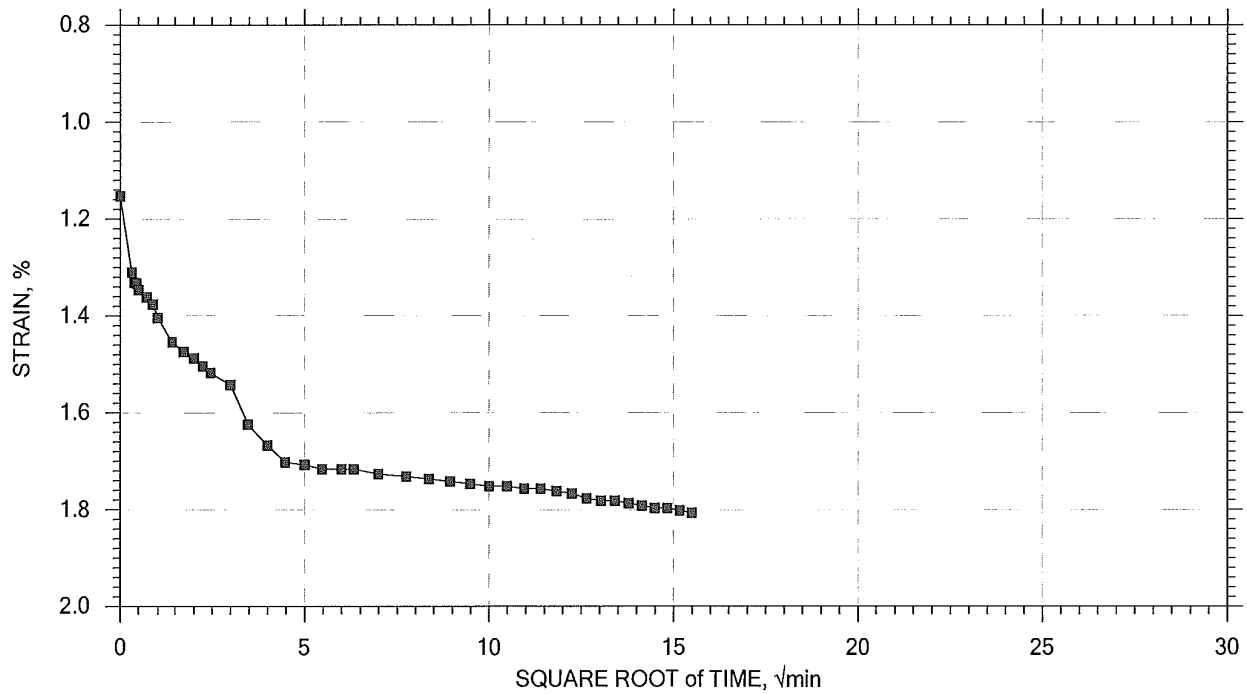
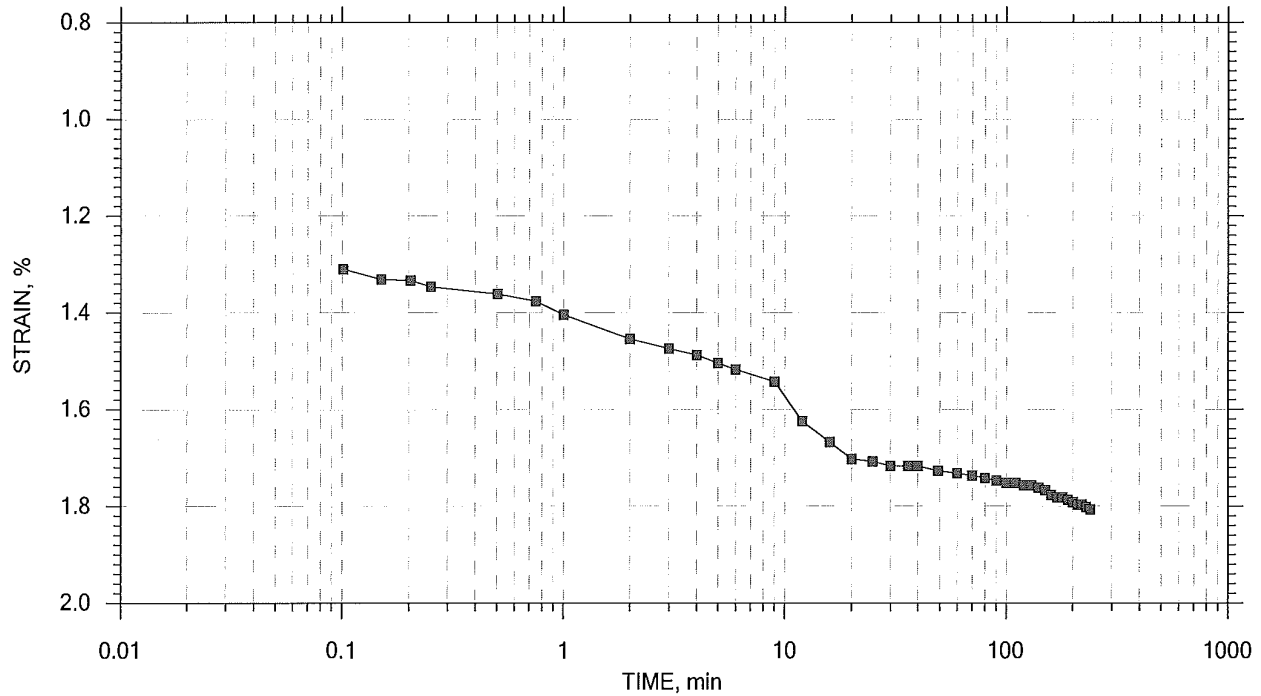
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 12

Stress: 0.25 tsf



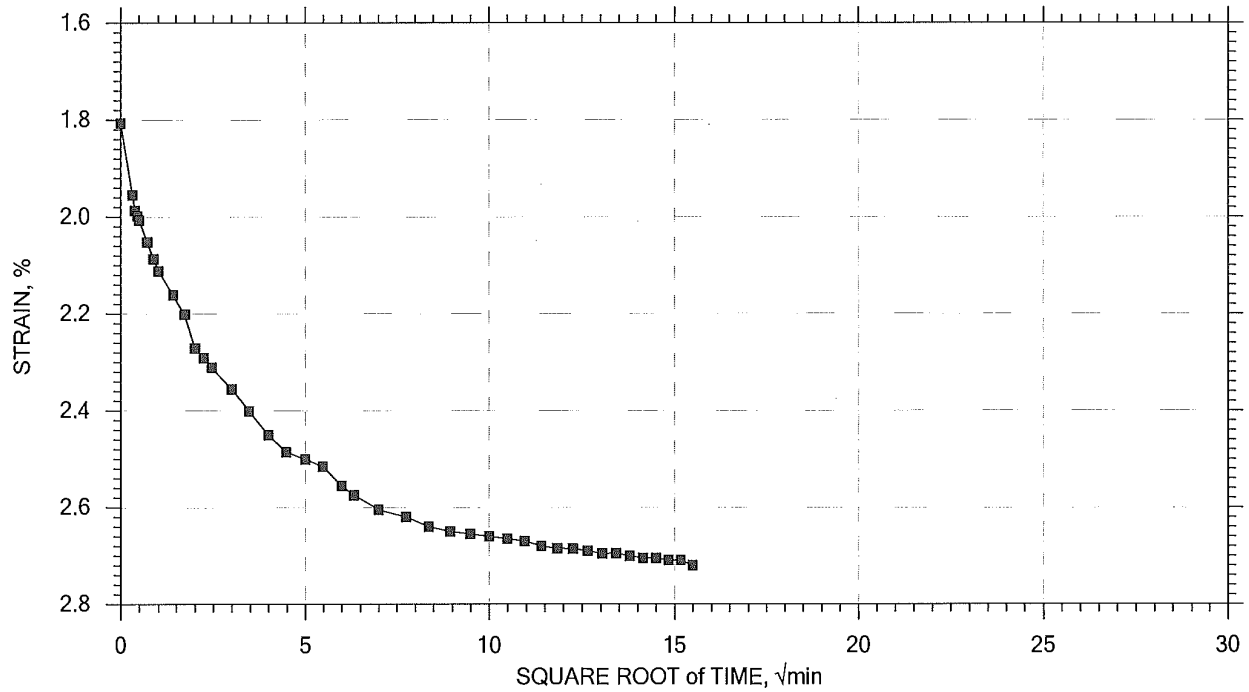
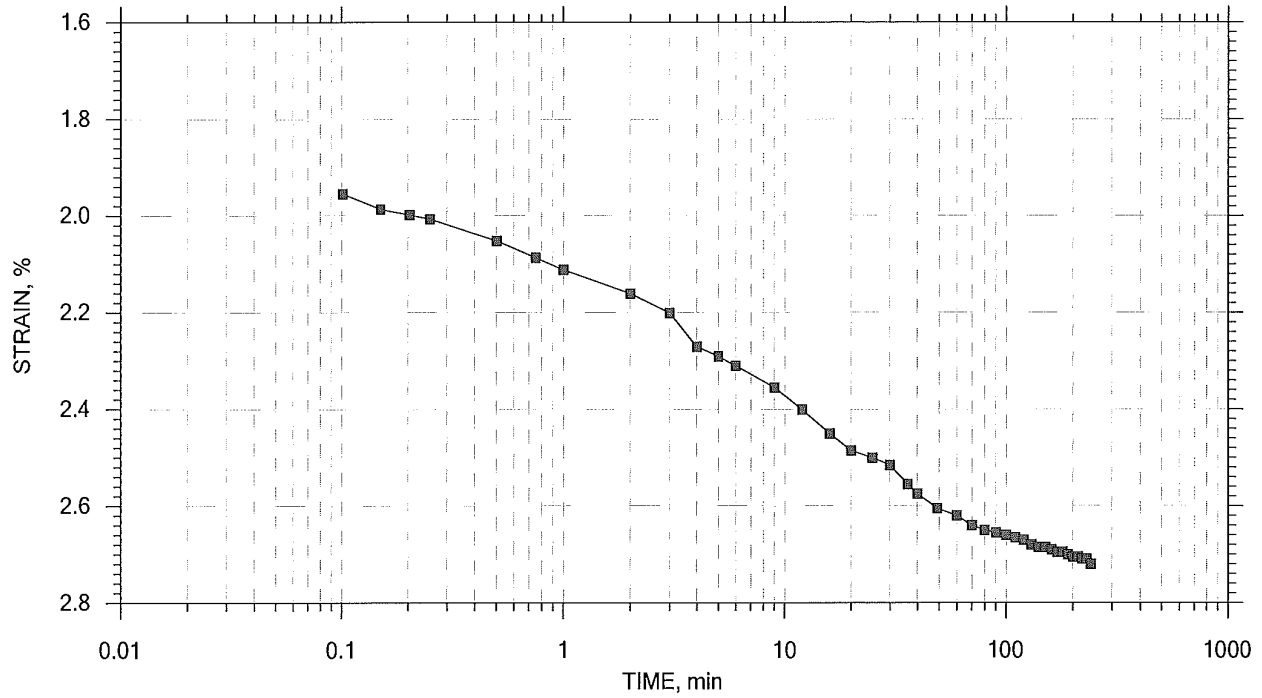
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 12

Stress: 0.5 tsf



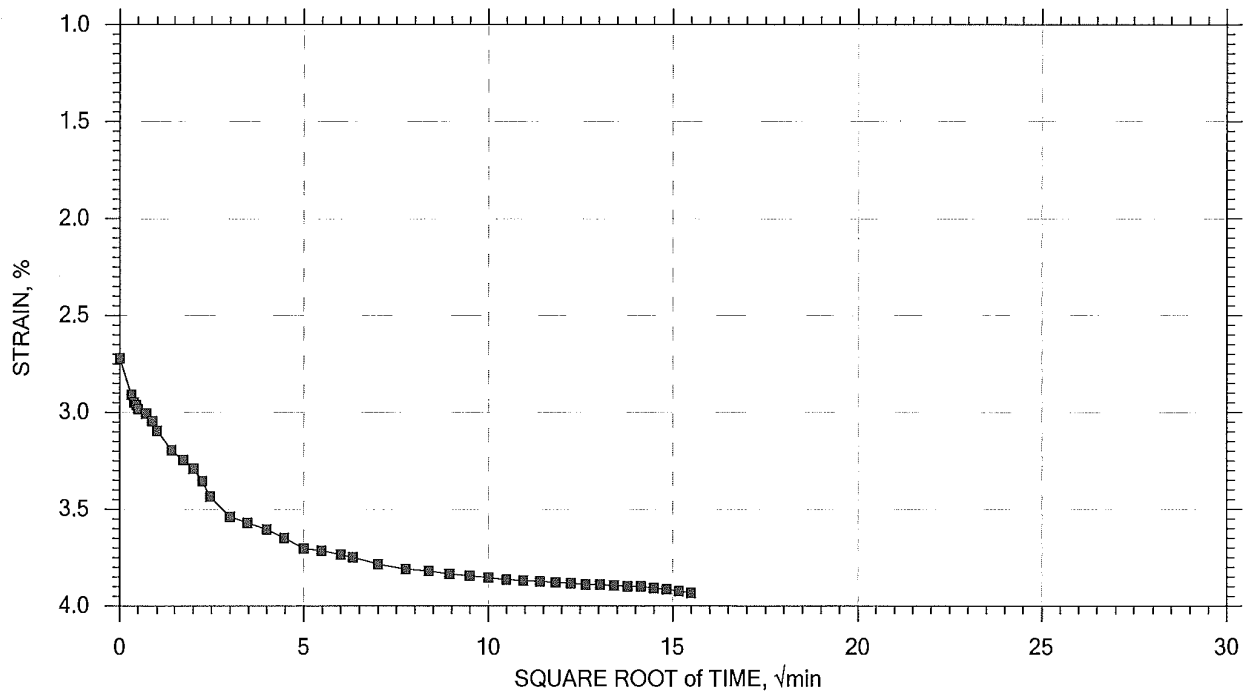
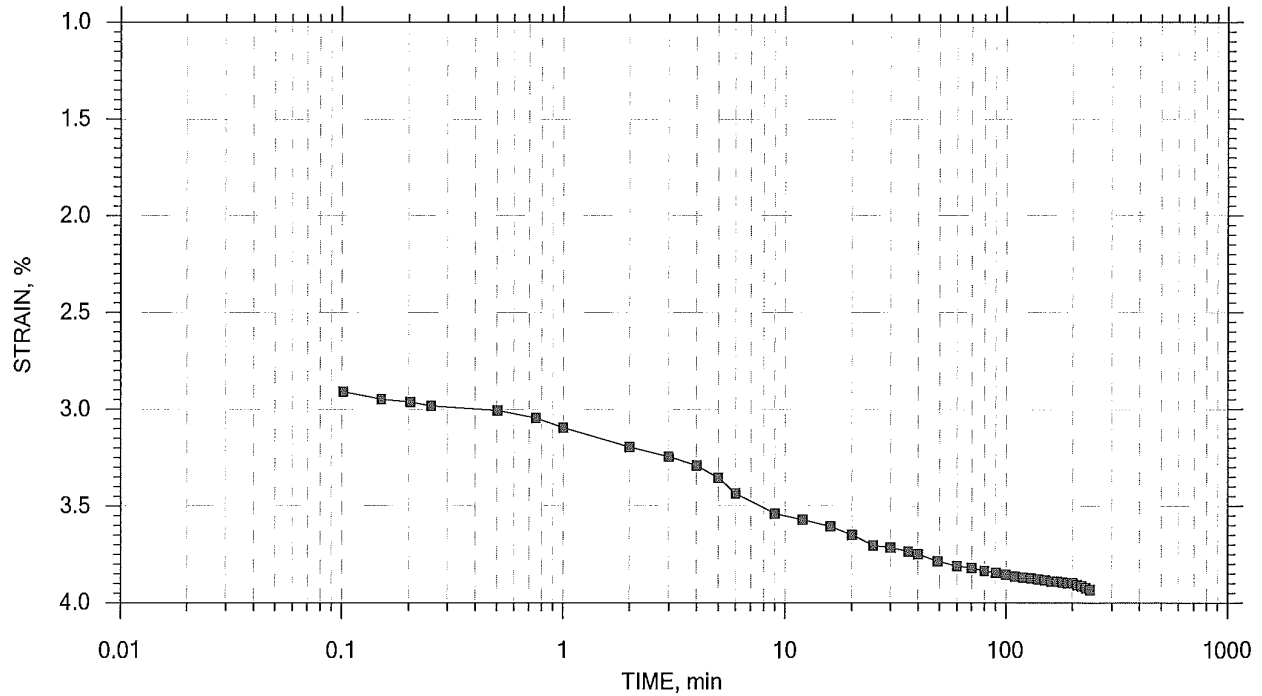
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 12

Stress: 1 tsf



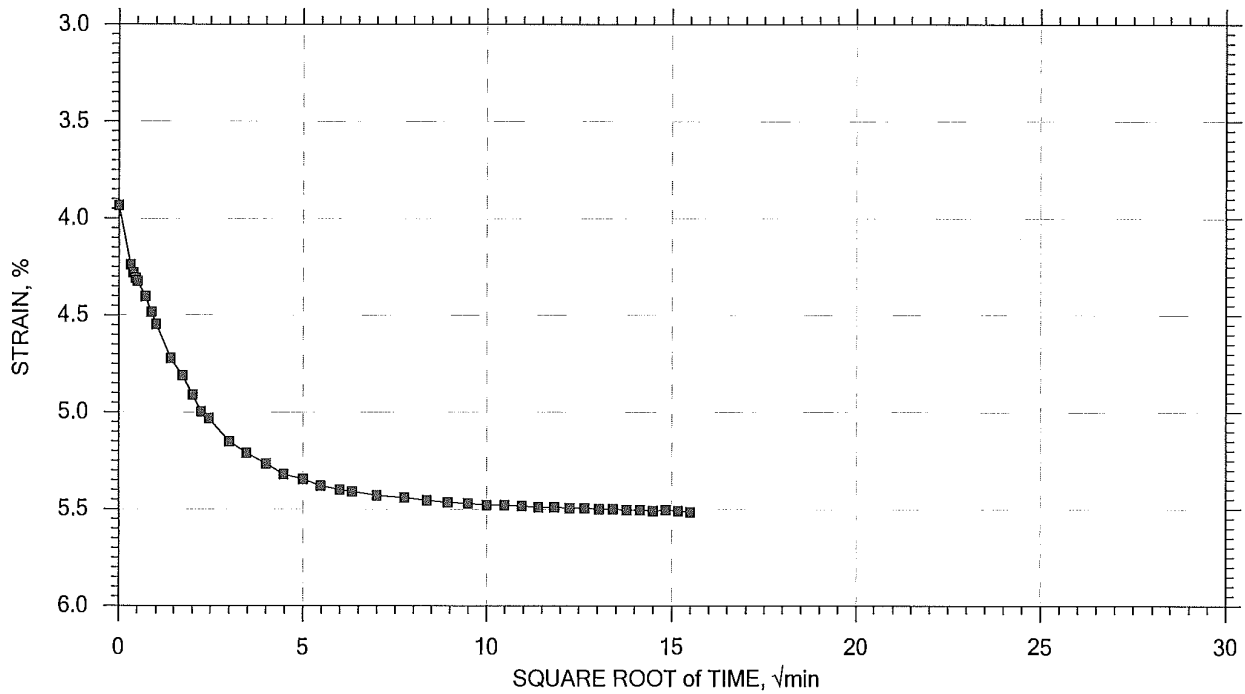
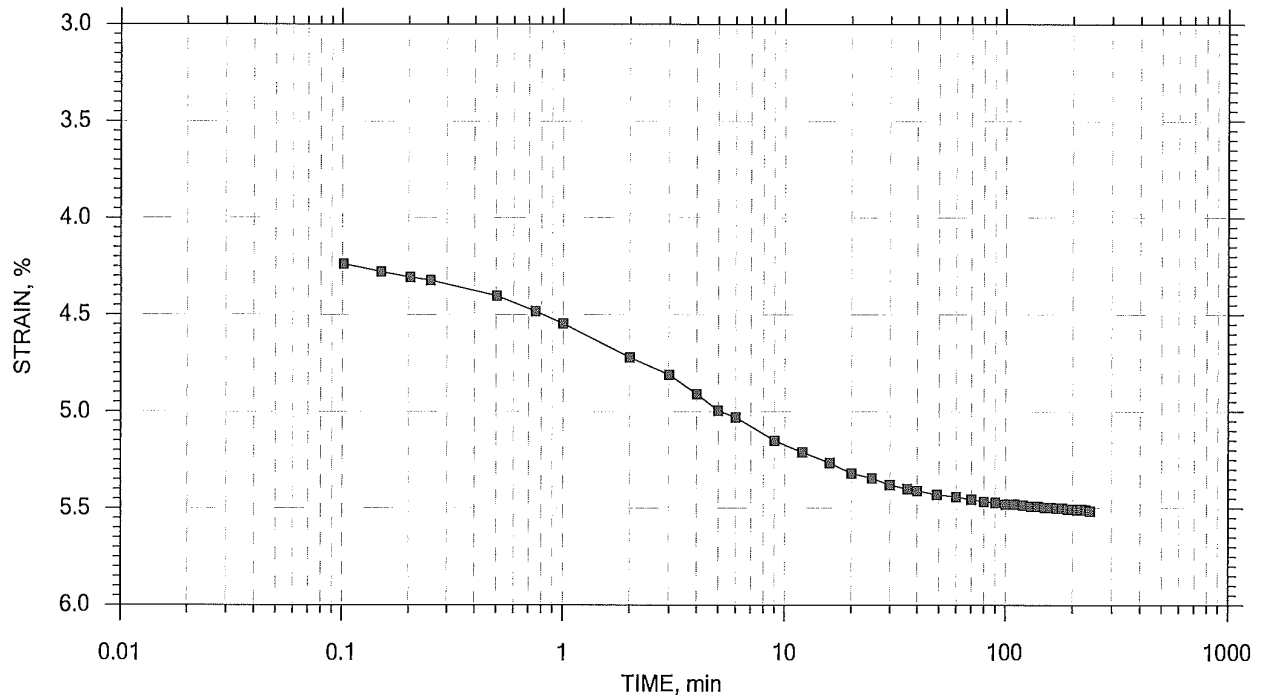
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 12

Stress: 2 tsf



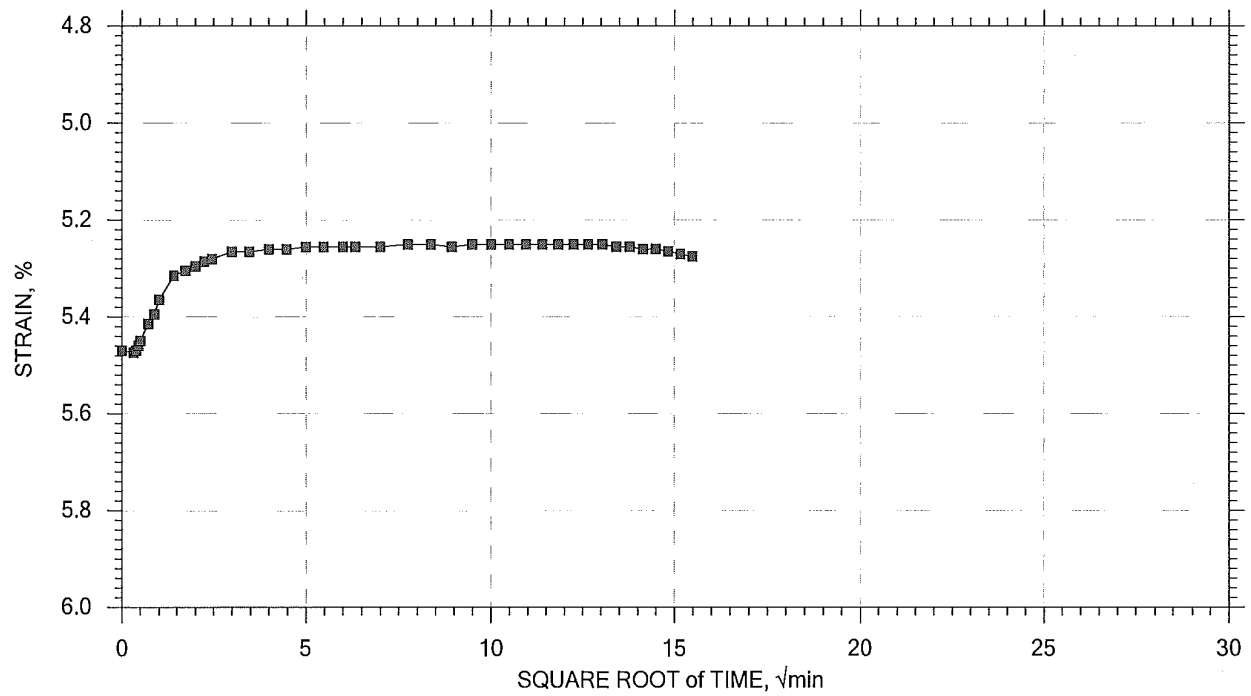
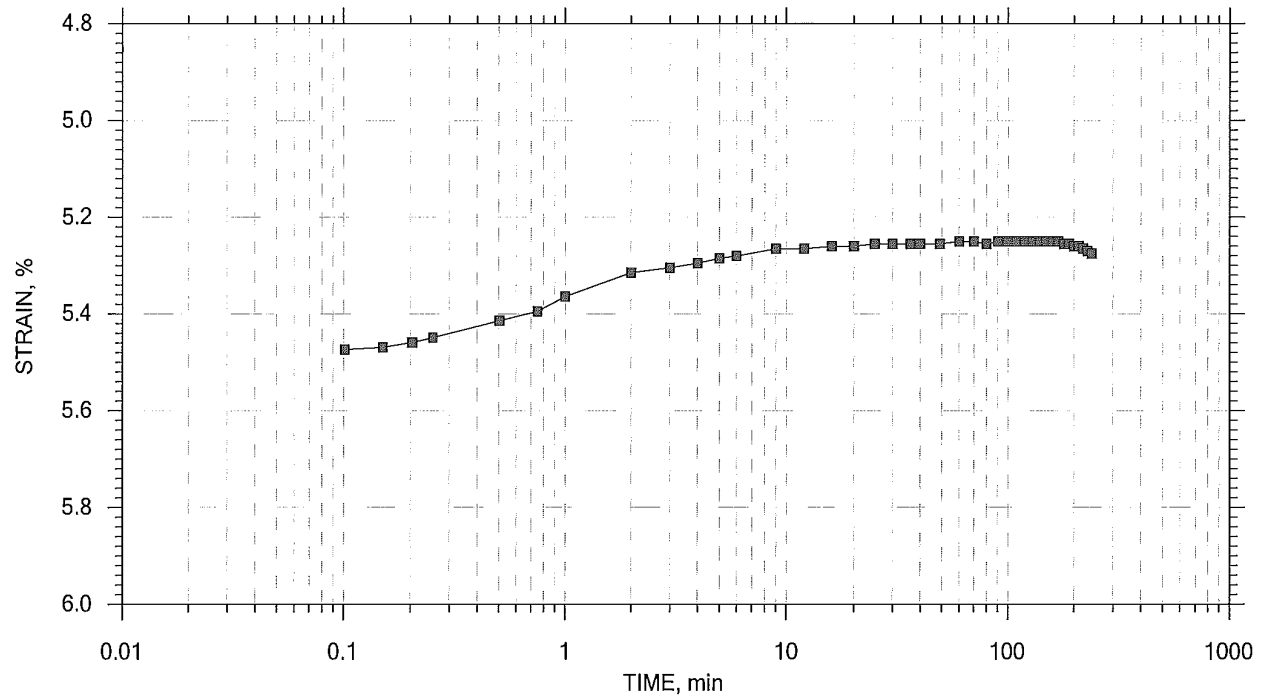
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 12

Stress: 1 tsf



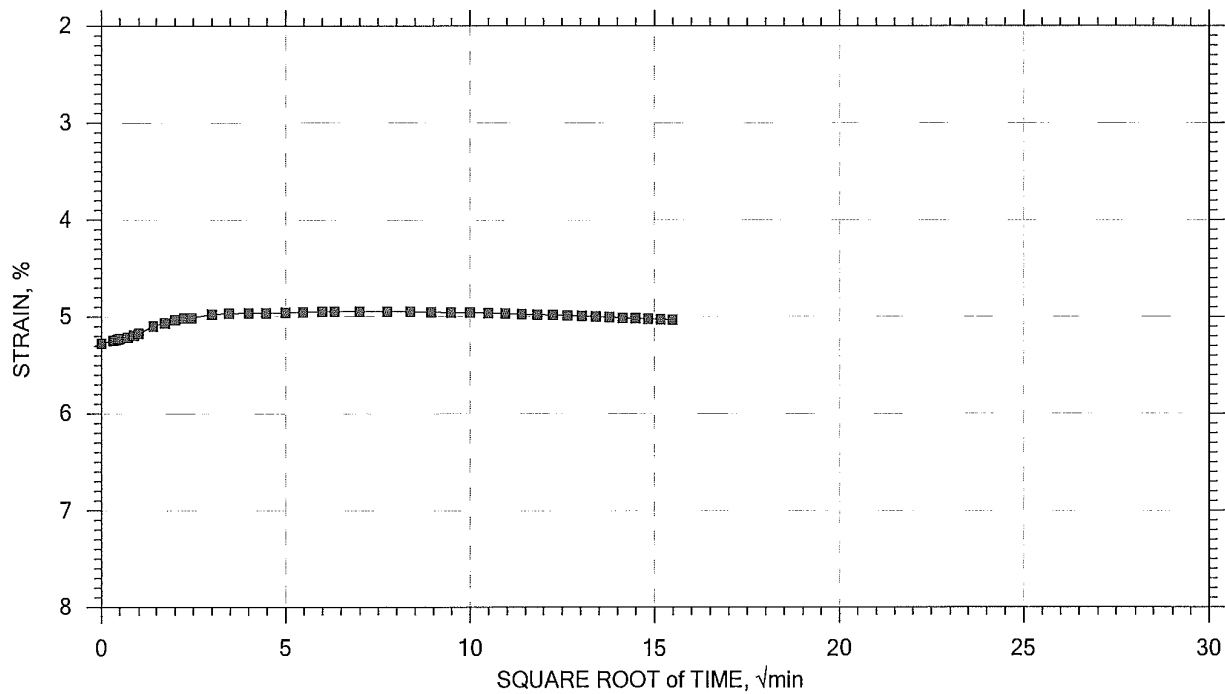
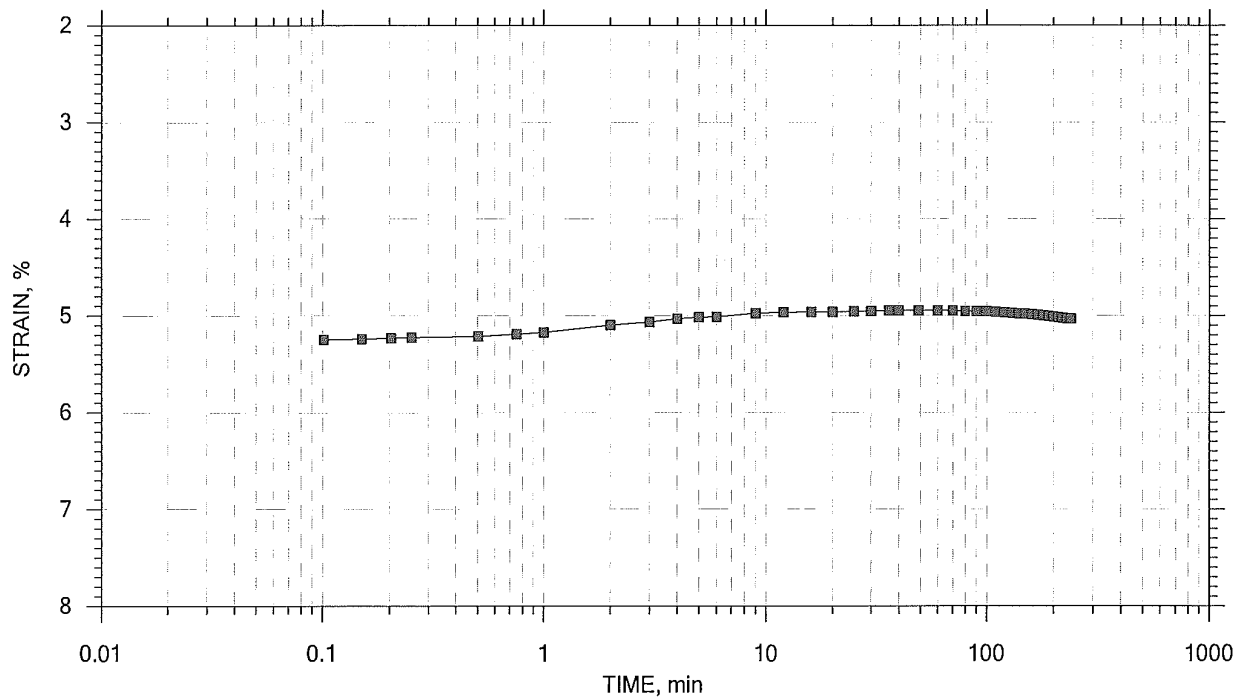
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 12

Stress: 0.5 tsf



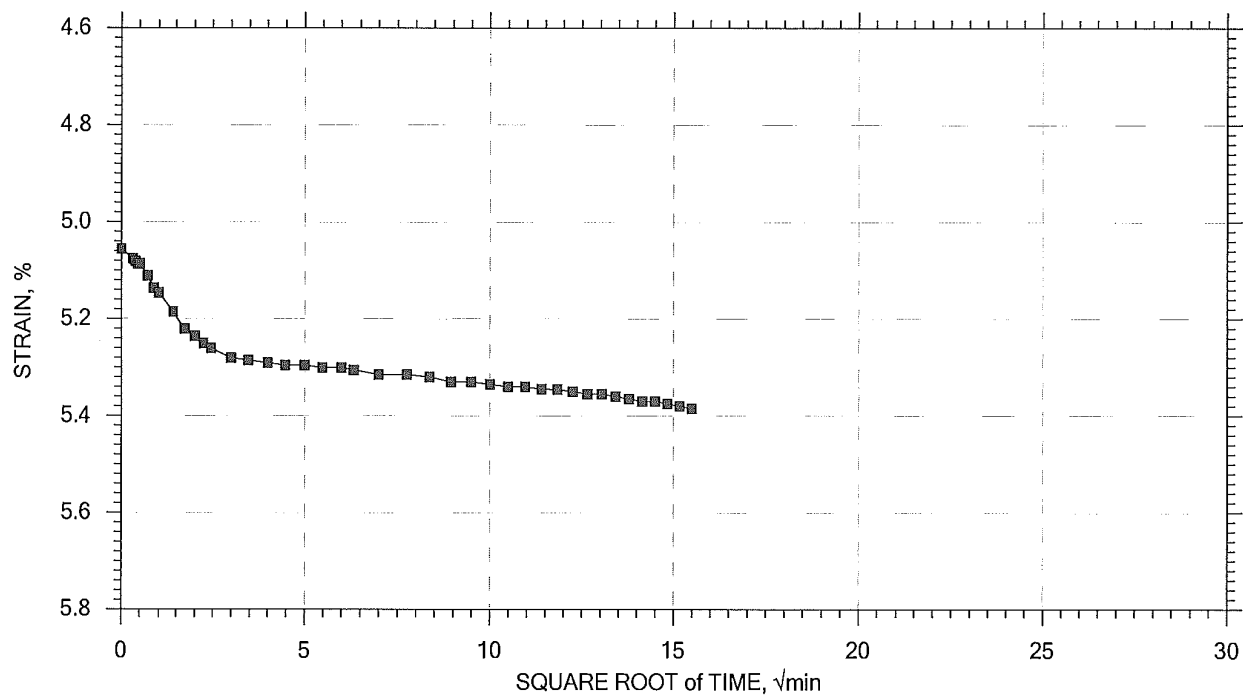
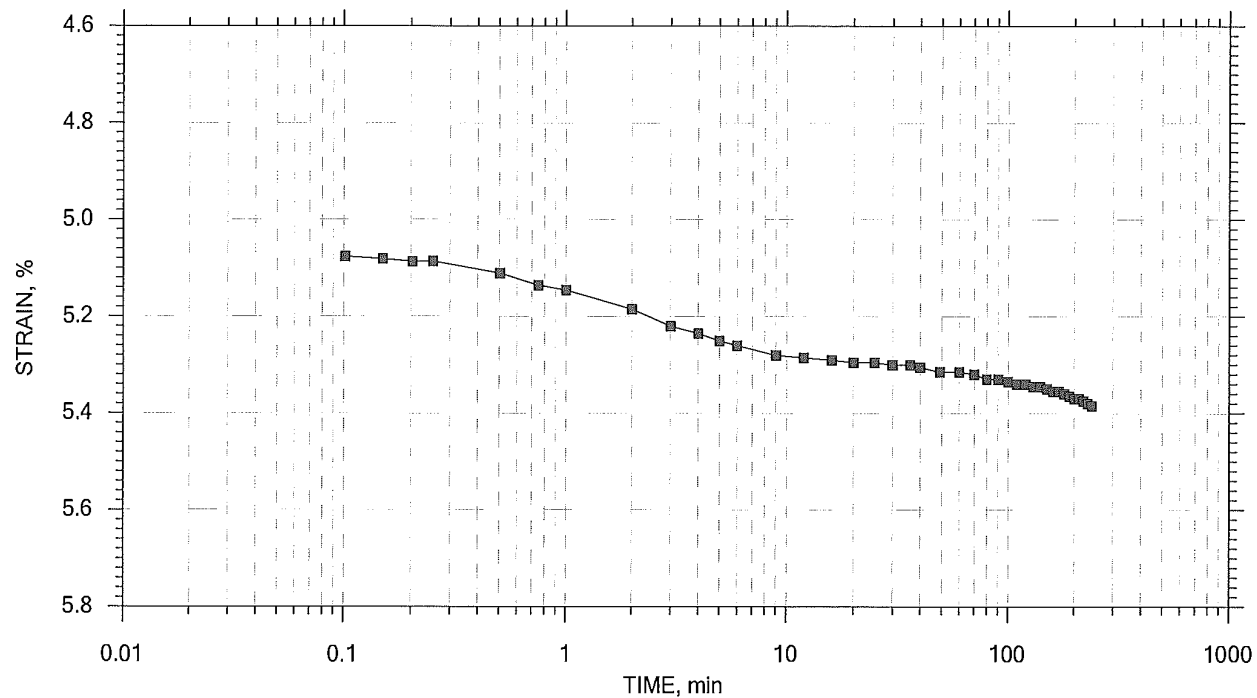
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 12

Stress: 1 tsf



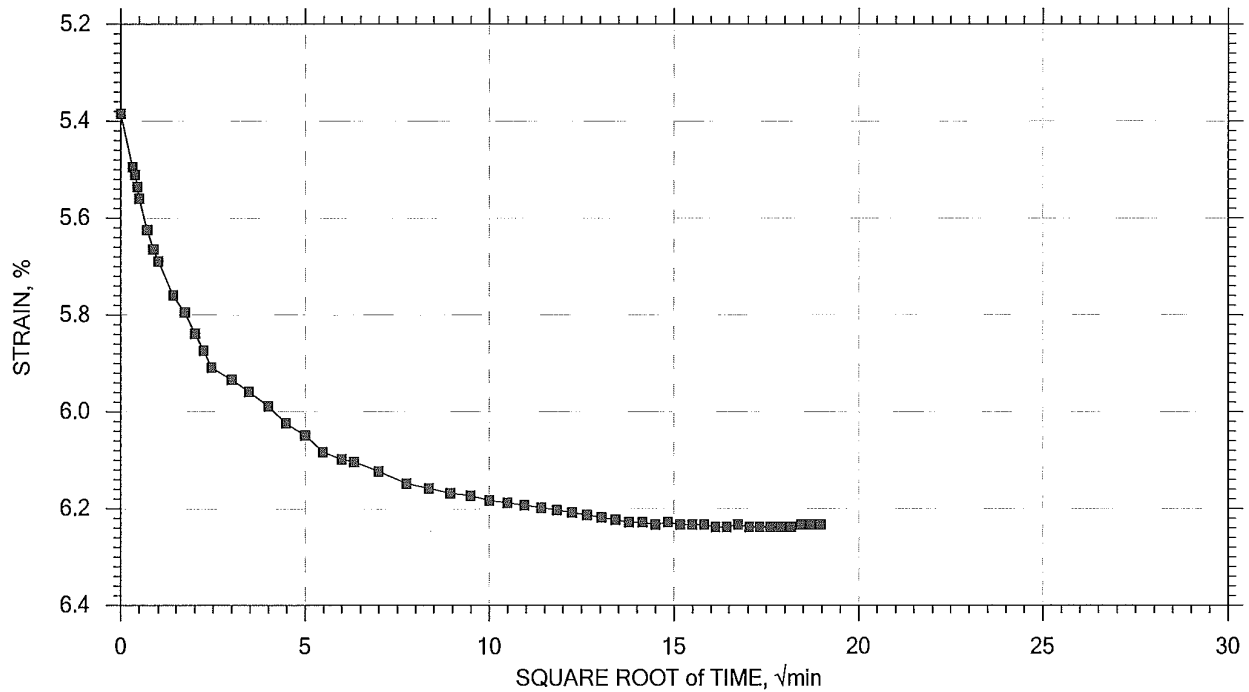
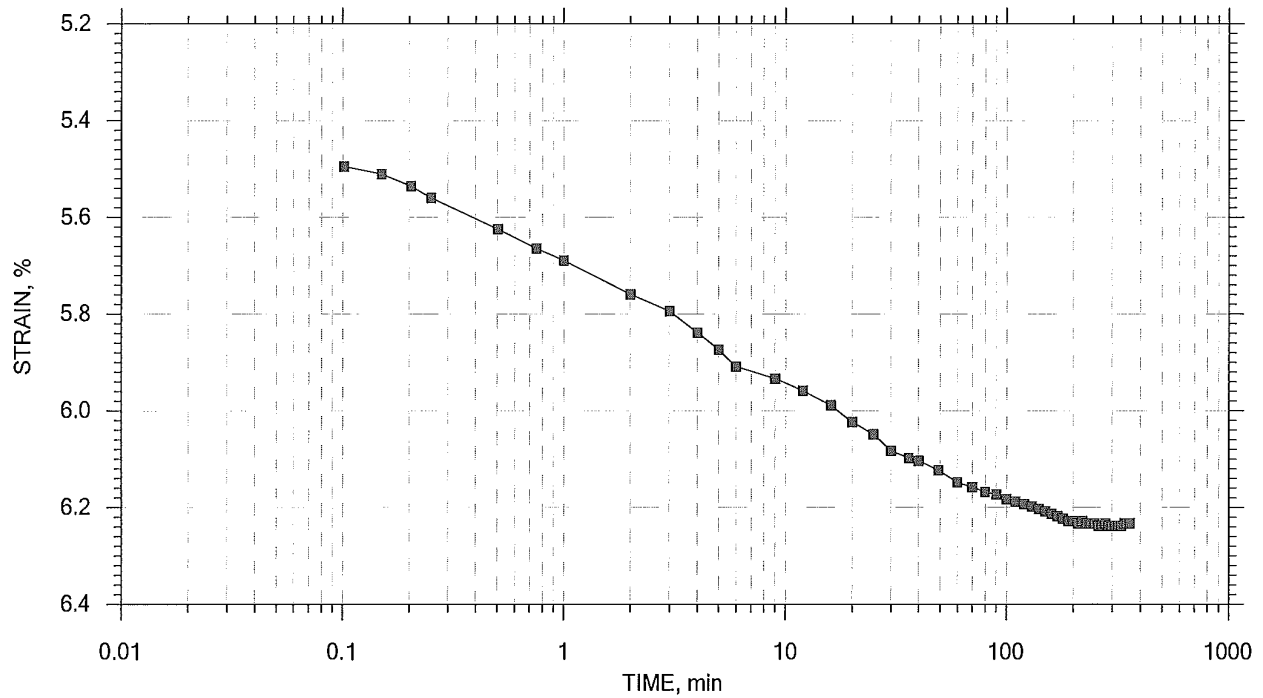
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 12

Stress: 2 tsf



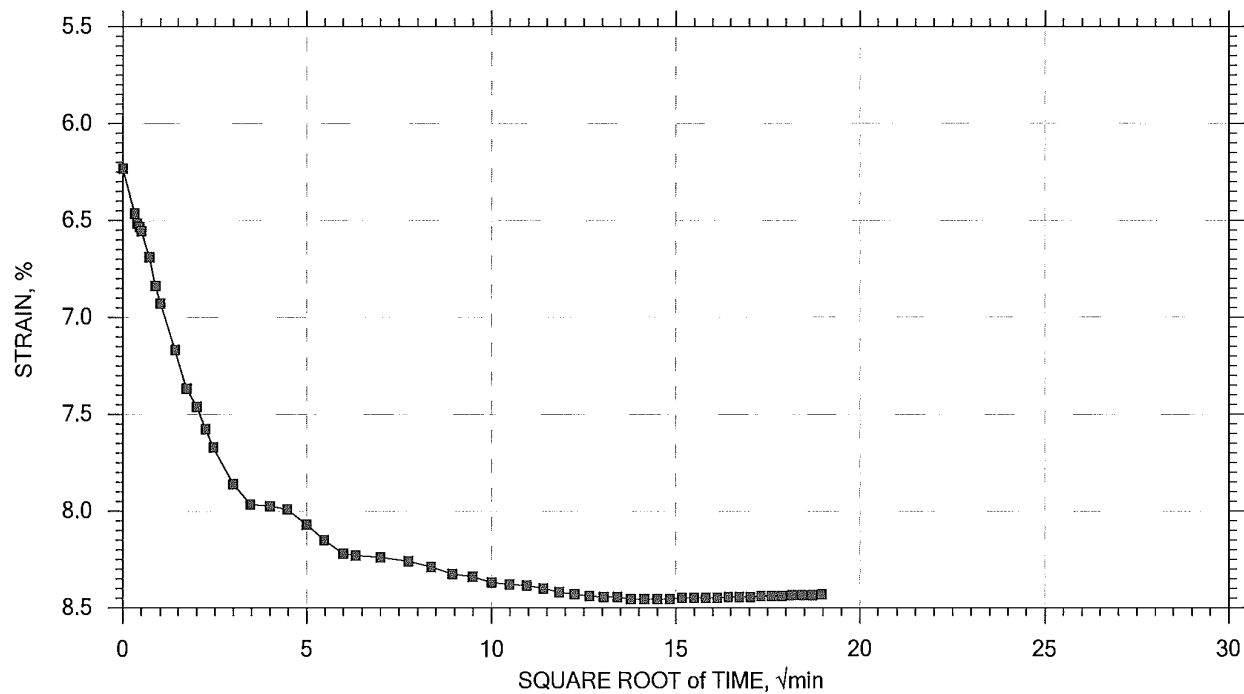
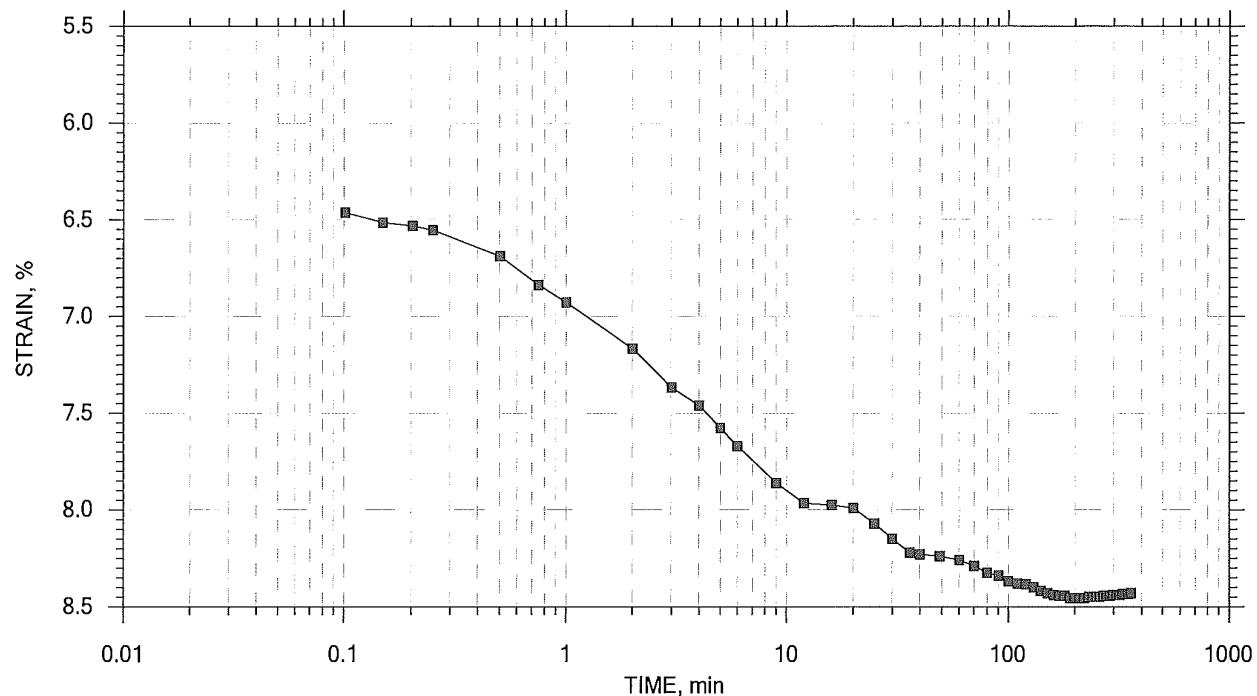
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 12

Stress: 4 tsf



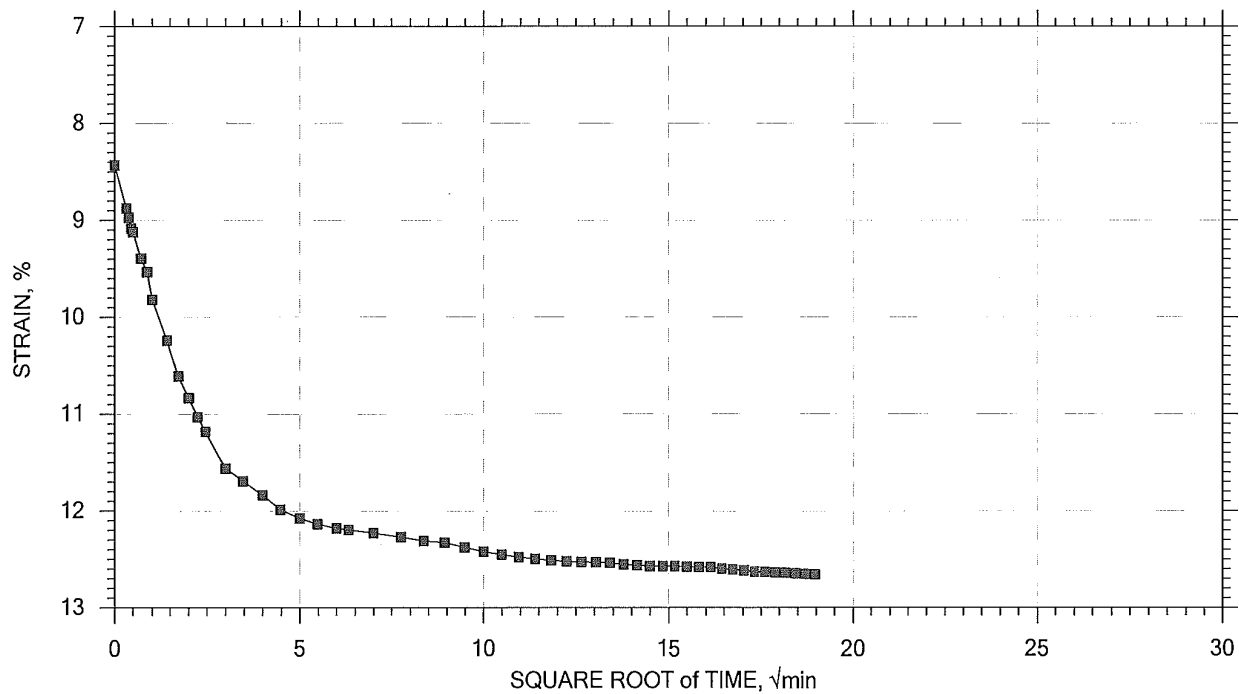
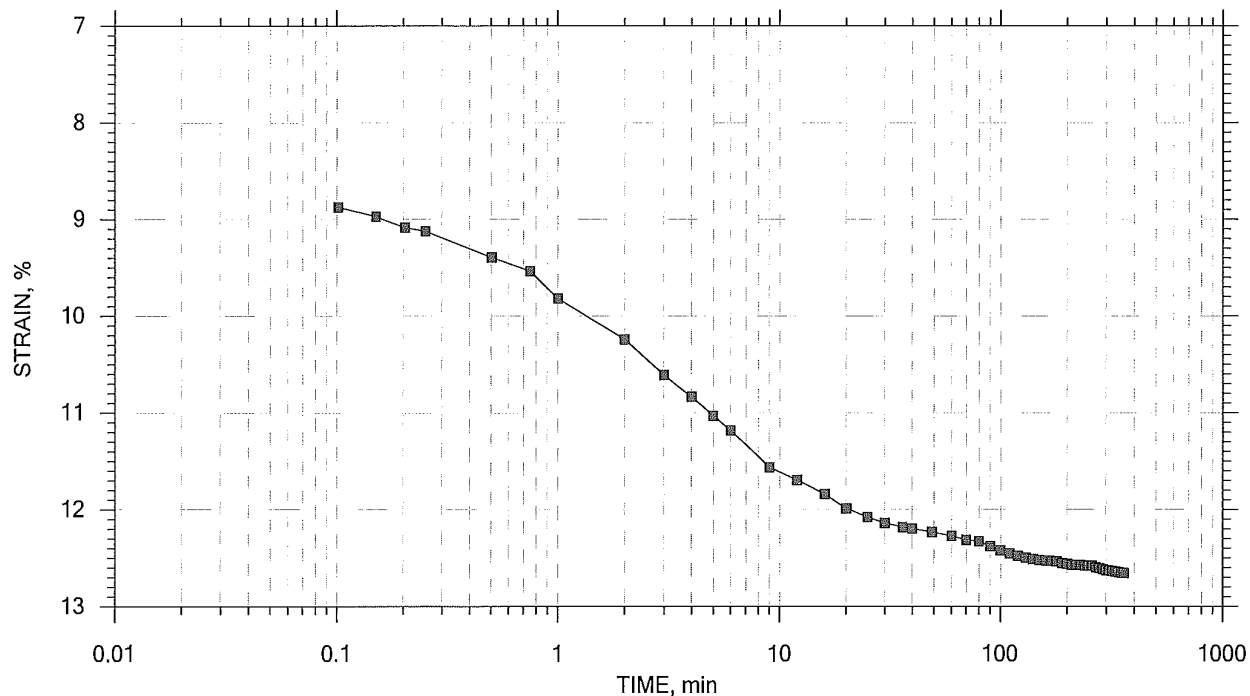
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 12

Stress: 8 tsf



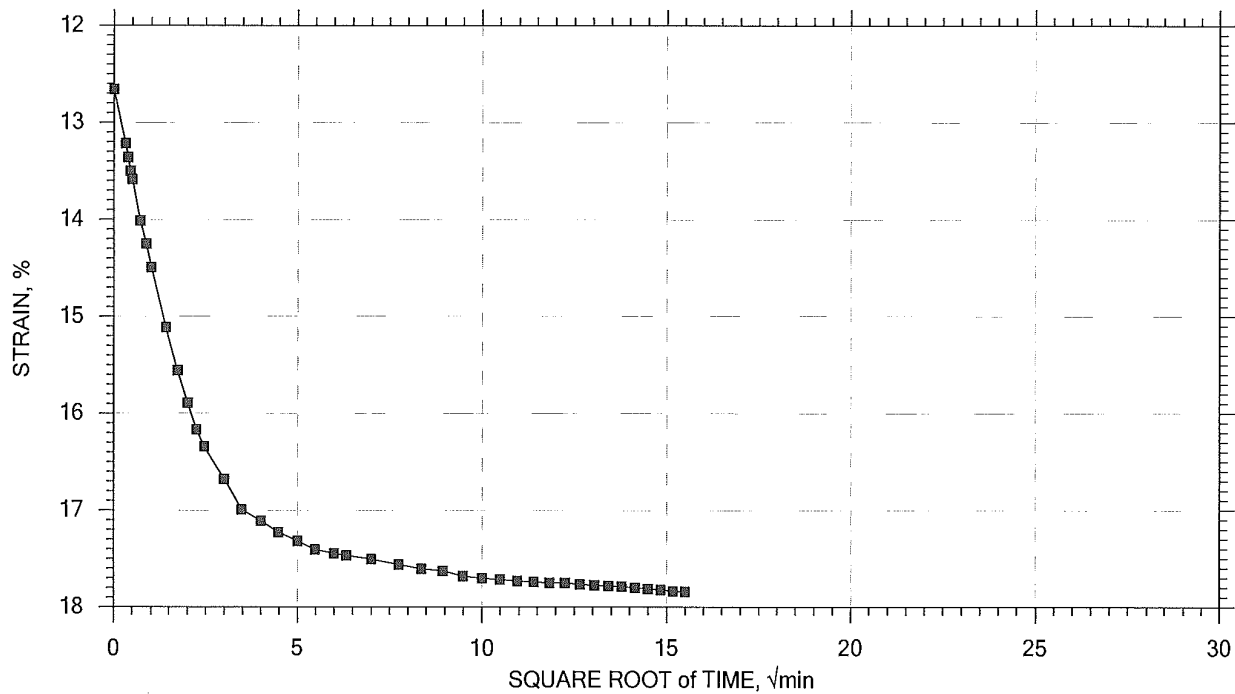
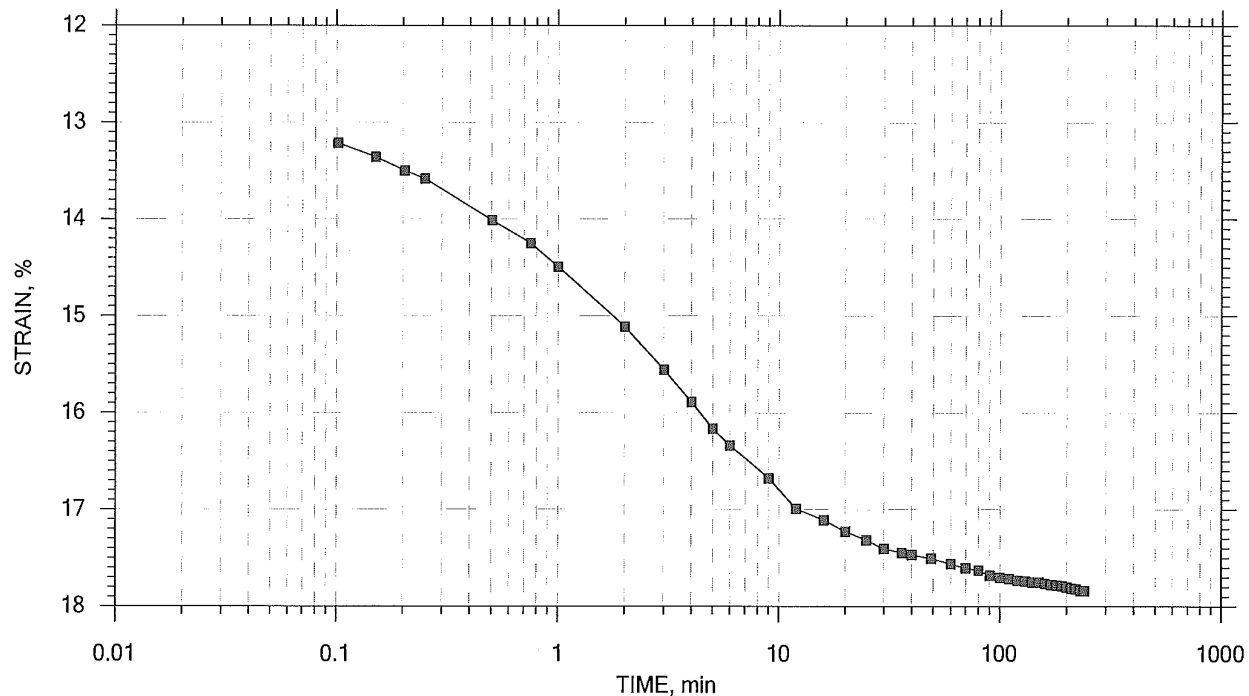
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 12

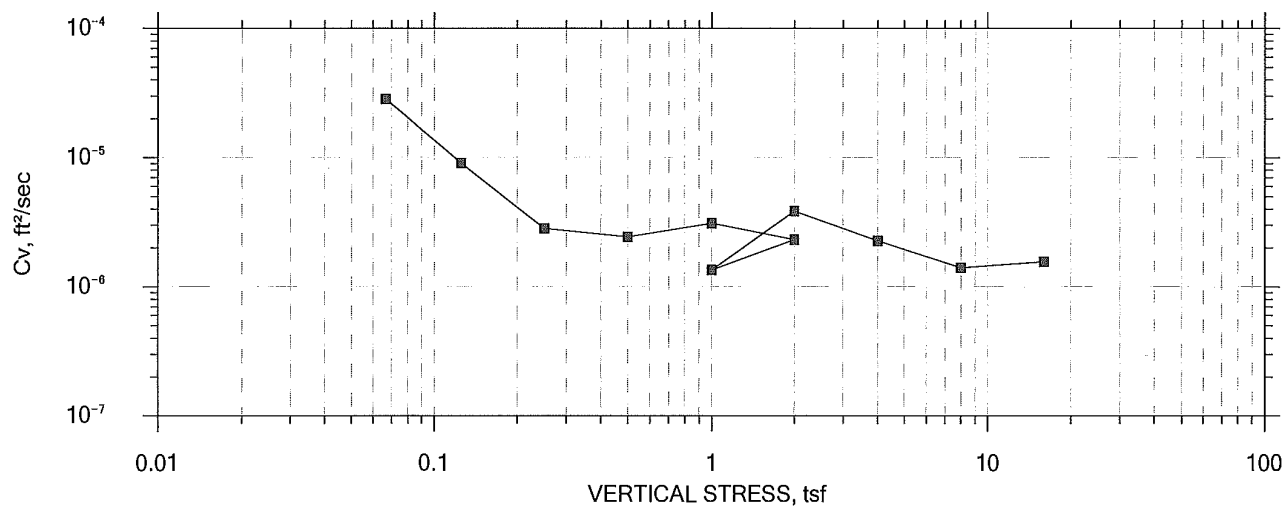
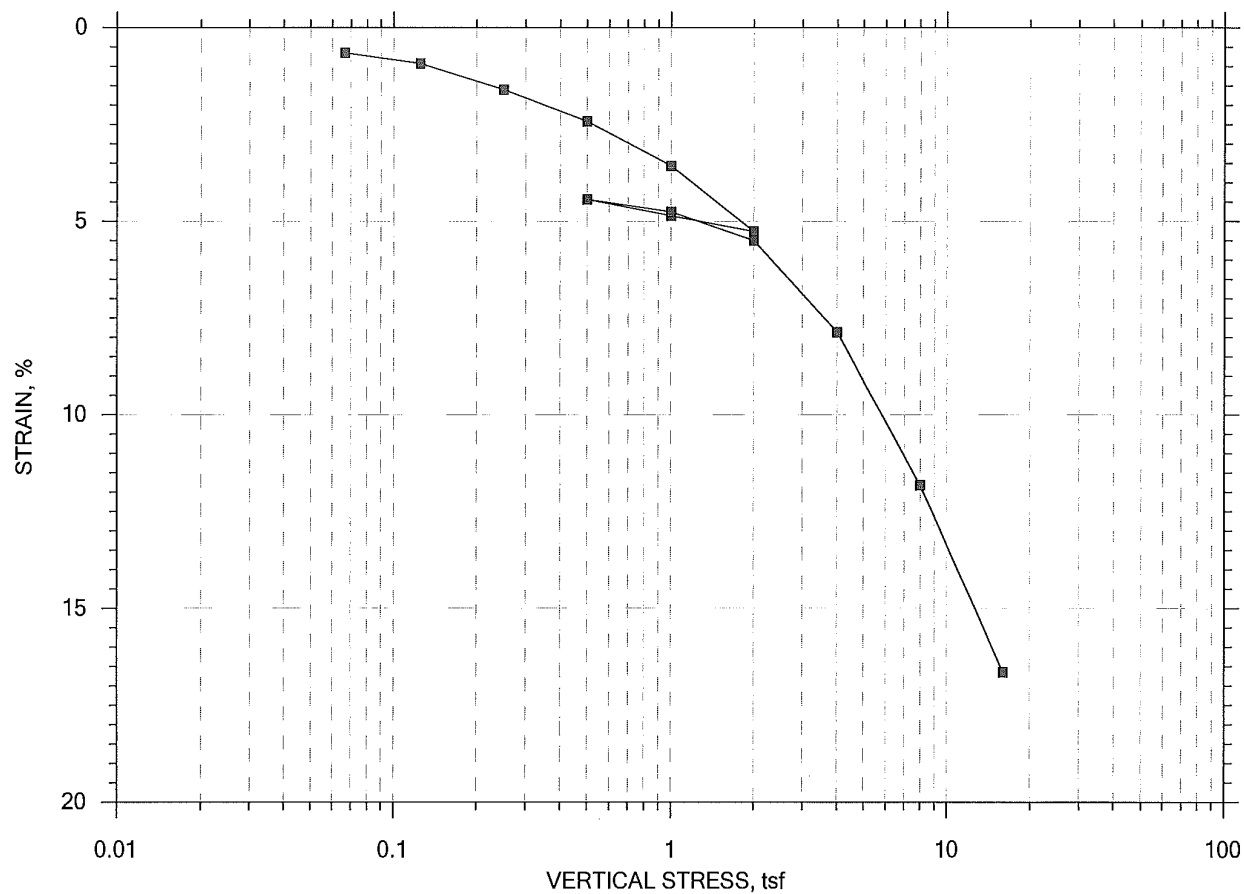
Stress: 16 tsf




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-50	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/10/14	Test No.: IP-5
	Depth: 19-21 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		

One-Dimensional Consolidation by ASTM D2435 - Method B

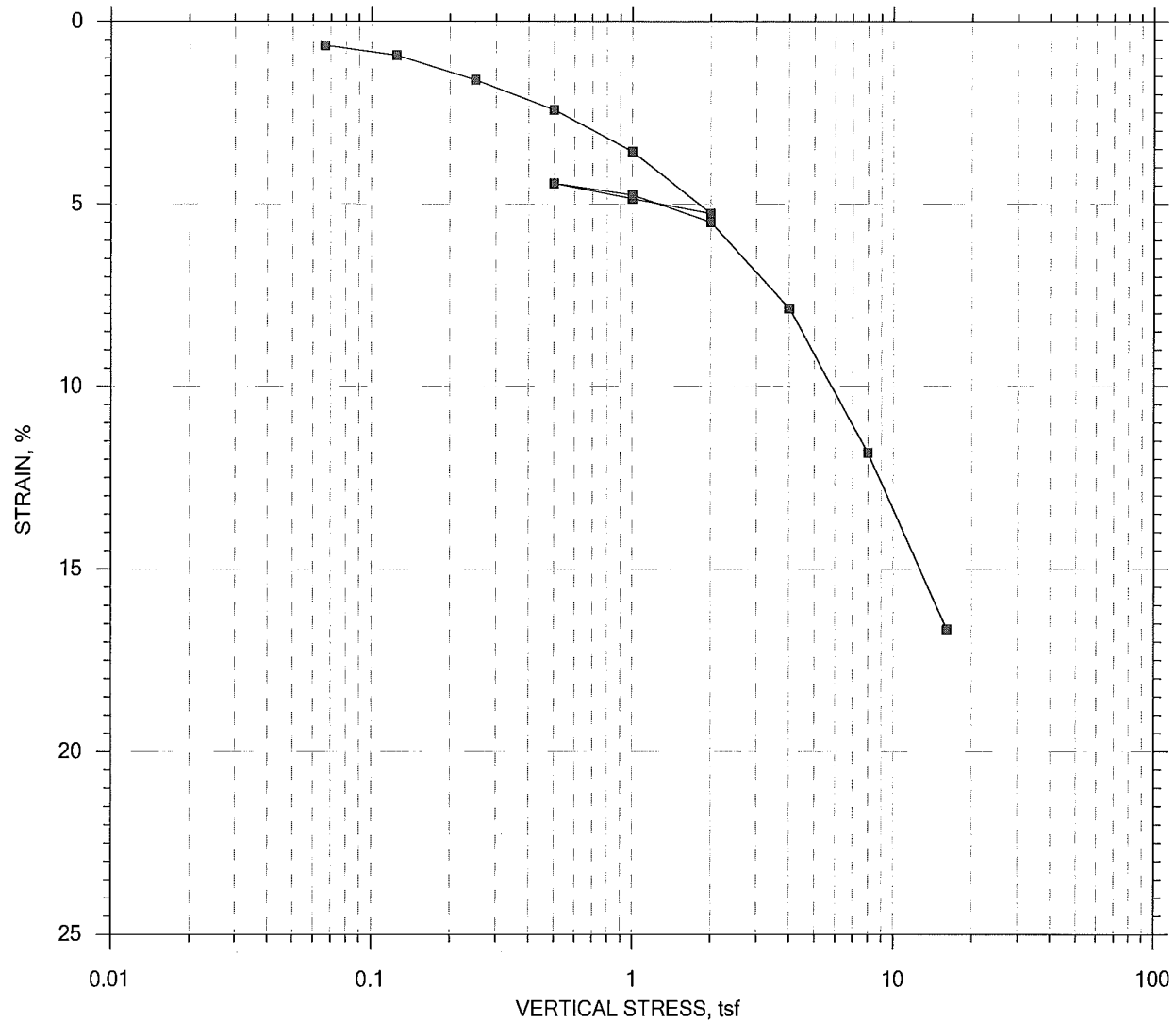
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test	
Current Vertical Effective Stress: ---				Water Content, %	38.02	25.54
Preconsolidation Stress: ---				Dry Unit Weight, pcf	83.569	100.69
Compression Ratio: ---				Saturation, %	99.43	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.05	0.70
LL: ---	PL: ---	PI: ---	GS: 2.74			

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-51
Sample No.: OT-1
Test No.: IP-6

Location: Chelsea, MA
Tested By: md
Test Date: 01/23/14
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 29-31 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System S

Estimated Specific Gravity: 2.74
Initial Void Ratio: 1.05
Final Void Ratio: 0.700

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.83 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	13302	RING		11330
Wt. Container + Wet Soil, gm	240.67	257.57	244.13	145.35
Wt. Container + Dry Soil, gm	179.65	216.63	216.63	117.31
Wt. Container, gm	8.3800	108.95	108.95	7.5100
Wt. Dry Soil, gm	171.27	107.68	107.68	109.80
Water Content, %	35.63	38.02	25.54	25.54
Void Ratio	---	1.05	0.700	---
Degree of Saturation, %	---	99.43	100.00	---
Dry Unit Weight, pcf	---	83.569	100.69	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 -- Method B

Project: Silverline
Boring No.: B-51
Sample No.: OT-1
Test No.: IP-6

Location: Chelsea, MA
Tested By: md
Test Date: 01/23/14
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 29-31 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System S

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.0666	0.006502	1.04	0.650	0.741	3.29e-005	9.76e-002	8.66e-003	
2	0.125	0.009246	1.03	0.925	3.750	6.44e-006	4.70e-002	8.17e-004	
3	0.250	0.01597	1.02	1.60	9.244	2.59e-006	5.38e-002	3.75e-004	
4	0.500	0.02415	0.999	2.42	9.322	2.53e-006	3.27e-002	2.23e-004	
5	1.00	0.03563	0.976	3.56	8.162	2.83e-006	2.30e-002	1.75e-004	
6	2.00	0.05260	0.941	5.26	7.641	2.93e-006	1.70e-002	1.34e-004	
7	1.00	0.04856	0.949	4.86	7.345	3.01e-006	4.04e-003	3.28e-005	
8	0.500	0.04431	0.958	4.43	30.002	7.44e-007	8.49e-003	1.70e-005	
9	1.00	0.04751	0.951	4.75	12.532	1.78e-006	6.40e-003	3.07e-005	
10	2.00	0.05494	0.936	5.49	6.175	3.58e-006	7.43e-003	7.17e-005	
11	4.00	0.07860	0.888	7.86	9.933	2.15e-006	1.18e-002	6.86e-005	
12	8.00	0.1182	0.807	11.8	11.286	1.77e-006	9.89e-003	4.72e-005	
13	16.0	0.1664	0.708	16.6	11.065	1.63e-006	6.03e-003	2.65e-005	

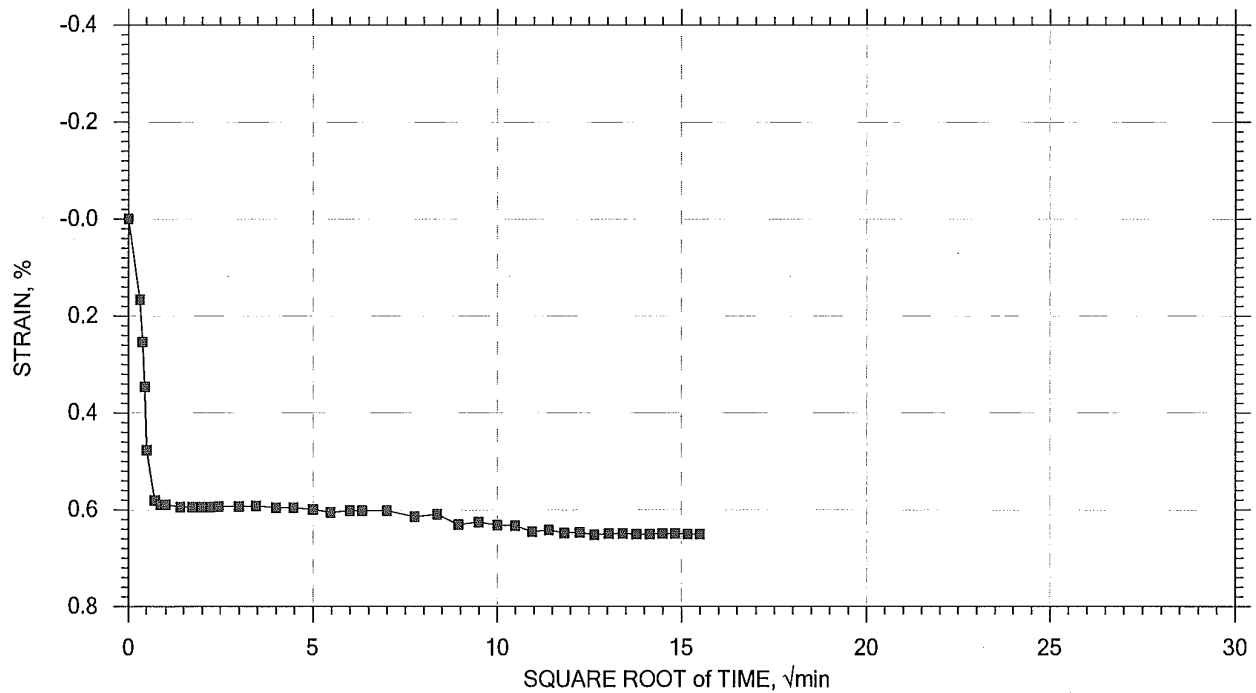
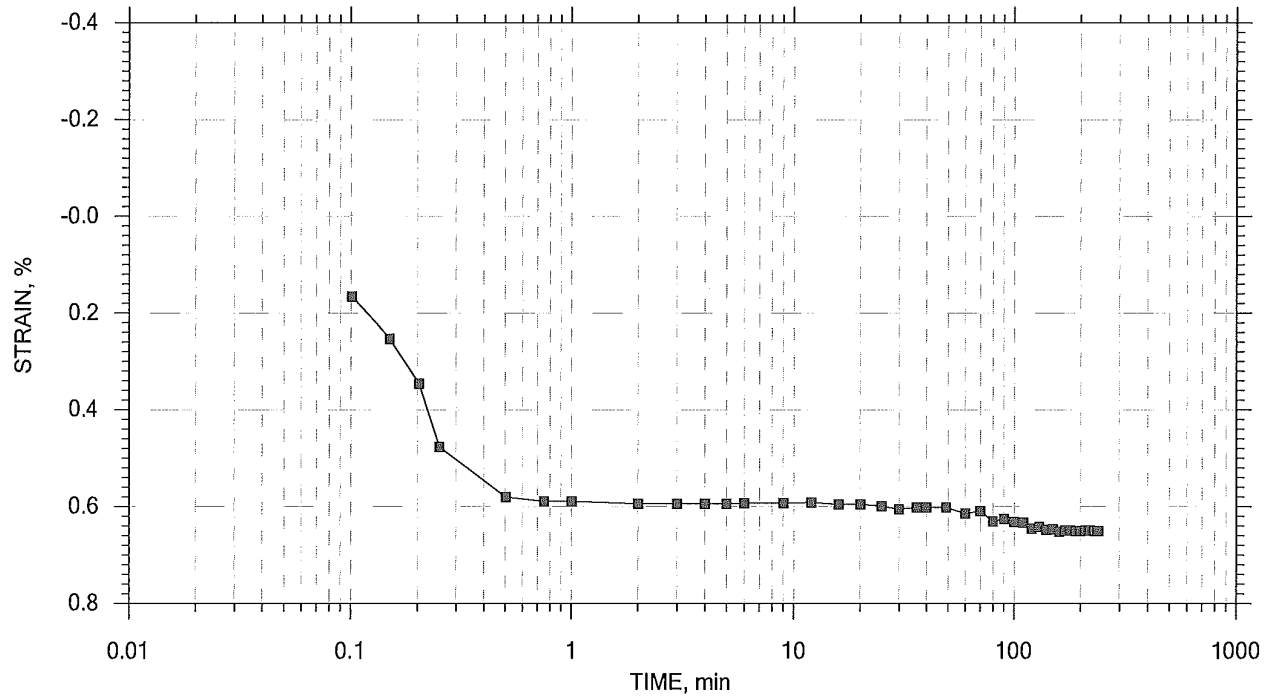
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.0666	0.006502	1.04	0.650	0.000	0.00e+000	9.76e-002	0.00e+000	0.00e+000
2	0.125	0.009246	1.03	0.925	0.000	0.00e+000	4.70e-002	0.00e+000	0.00e+000
3	0.250	0.01597	1.02	1.60	1.702	3.26e-006	5.38e-002	4.74e-004	0.00e+000
4	0.500	0.02415	0.999	2.42	2.242	2.44e-006	3.27e-002	2.16e-004	0.00e+000
5	1.00	0.03563	0.976	3.56	0.000	0.00e+000	2.30e-002	0.00e+000	0.00e+000
6	2.00	0.05260	0.941	5.26	2.797	1.86e-006	1.70e-002	8.52e-005	0.00e+000
7	1.00	0.04856	0.949	4.86	0.000	0.00e+000	4.04e-003	0.00e+000	0.00e+000
8	0.500	0.04431	0.958	4.43	0.000	0.00e+000	8.49e-003	0.00e+000	0.00e+000
9	1.00	0.04751	0.951	4.75	3.797	1.37e-006	6.40e-003	2.36e-005	0.00e+000
10	2.00	0.05494	0.936	5.49	1.268	4.05e-006	7.43e-003	8.11e-005	0.00e+000
11	4.00	0.07860	0.888	7.86	2.322	2.14e-006	1.18e-002	6.82e-005	0.00e+000
12	8.00	0.1182	0.807	11.8	3.882	1.19e-006	9.89e-003	3.19e-005	0.00e+000
13	16.0	0.1664	0.708	16.6	2.828	1.48e-006	6.03e-003	2.41e-005	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Volume Step 1 of 13

Stress: 0.066634 tsf



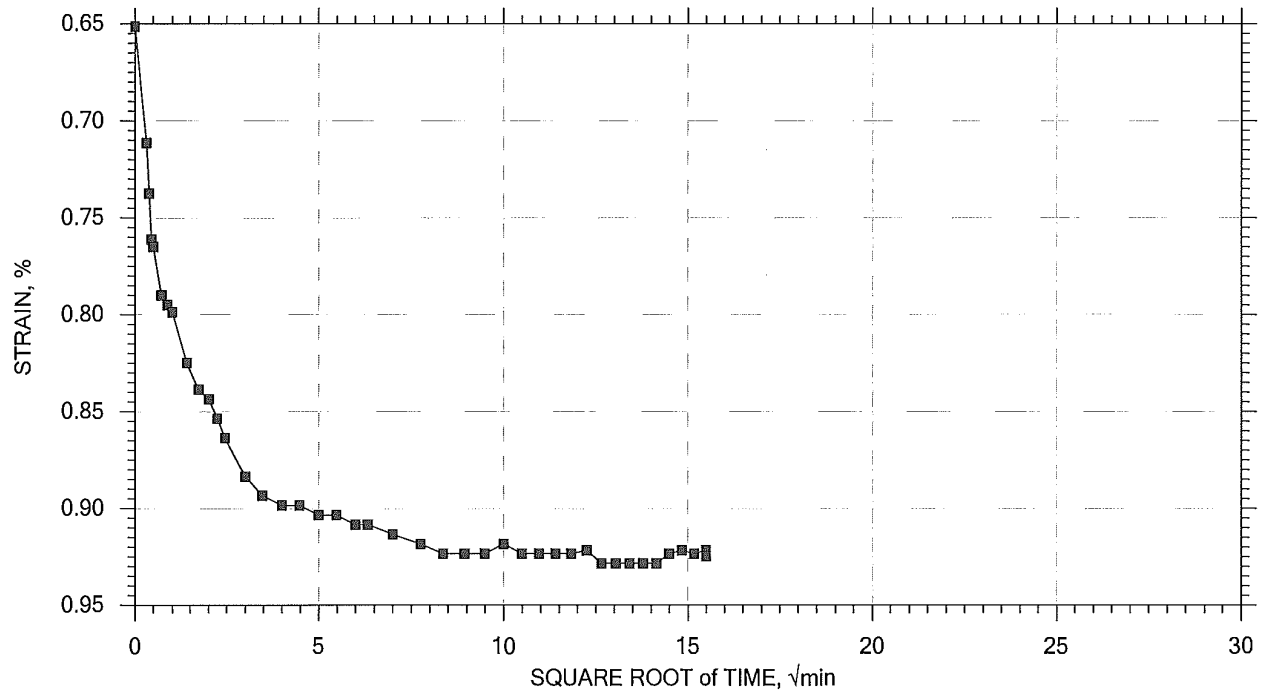
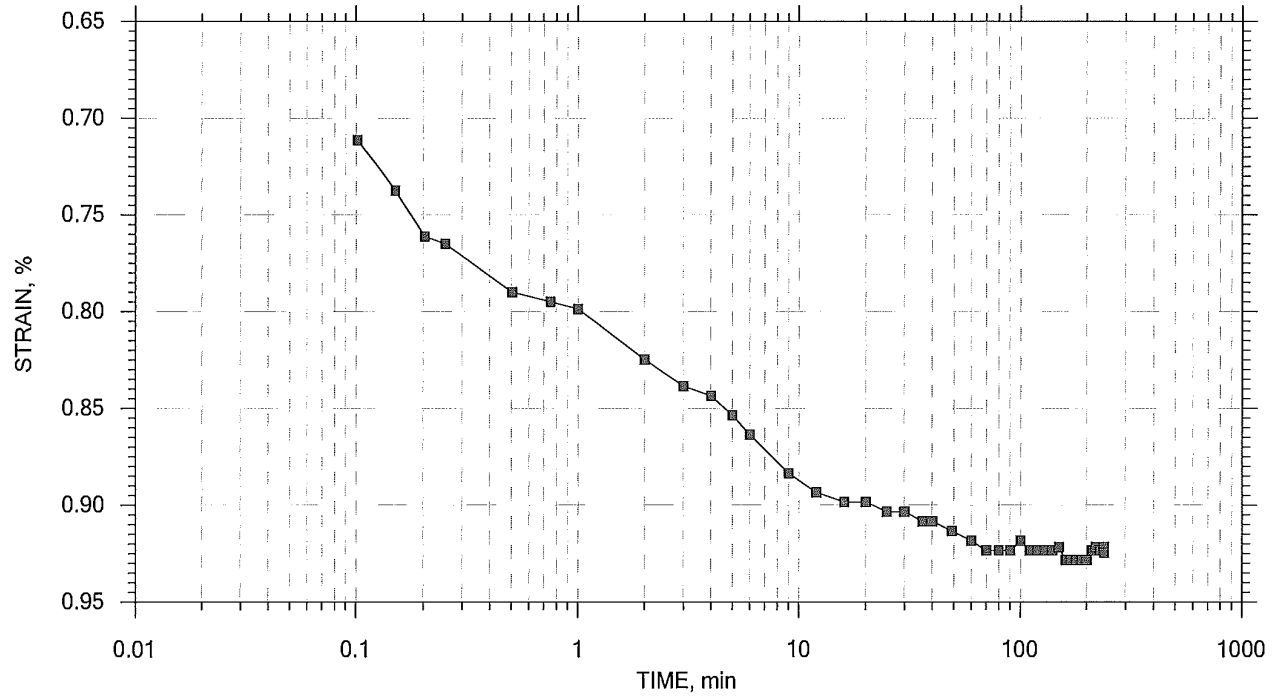
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 13

Stress: 0.125 tsf



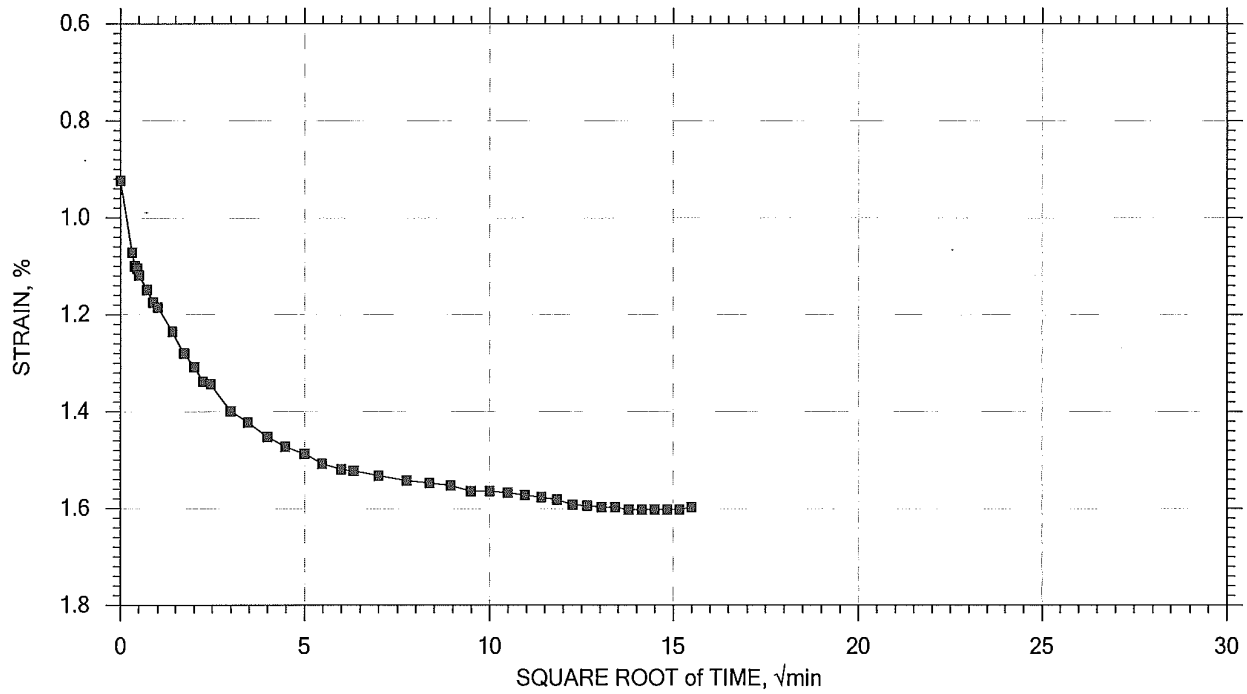
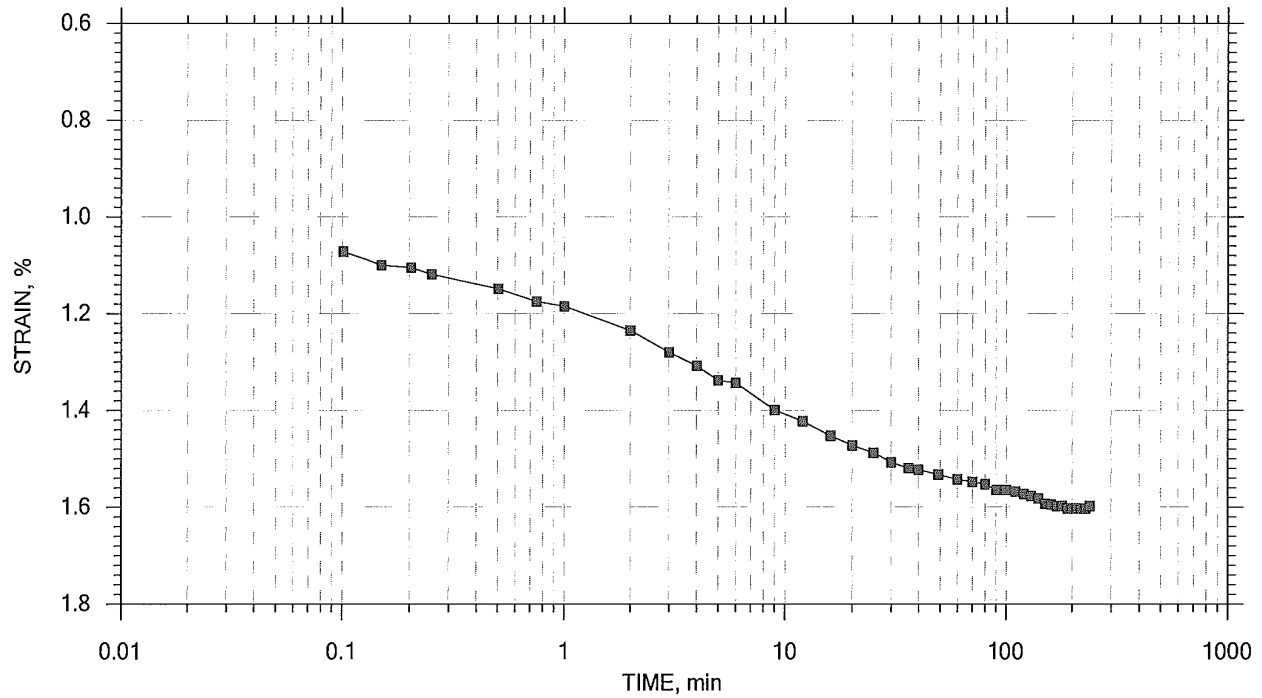
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 13

Stress: 0.25 tsf



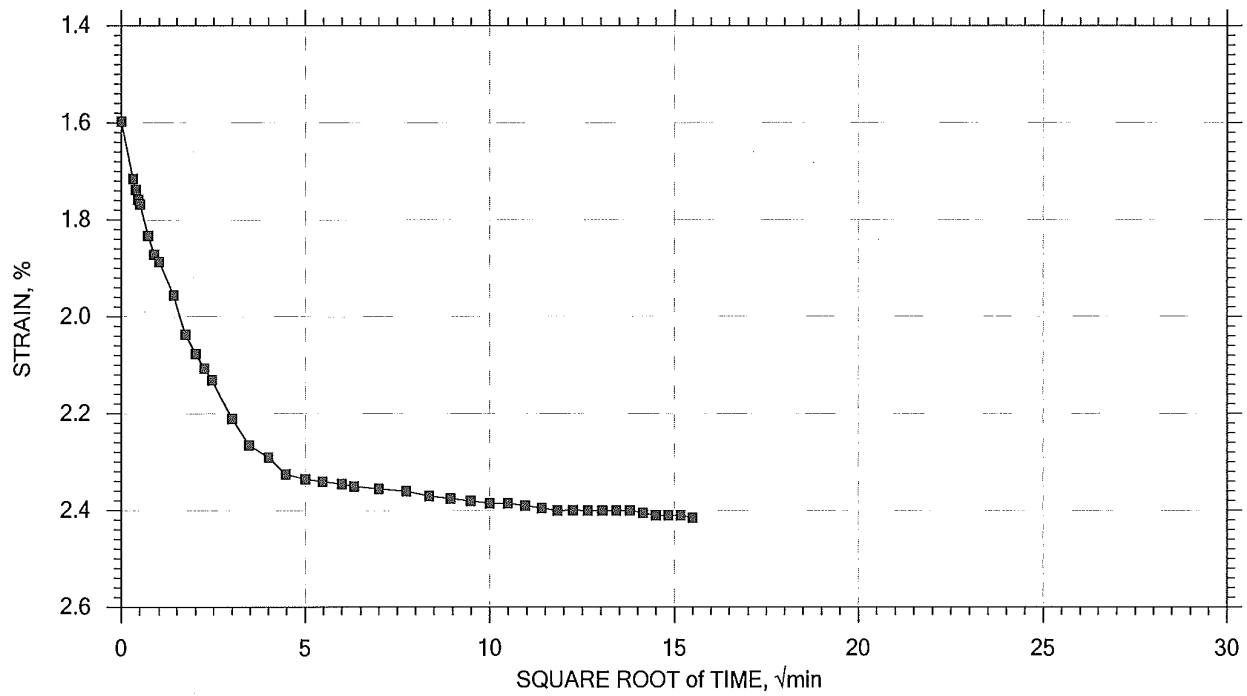
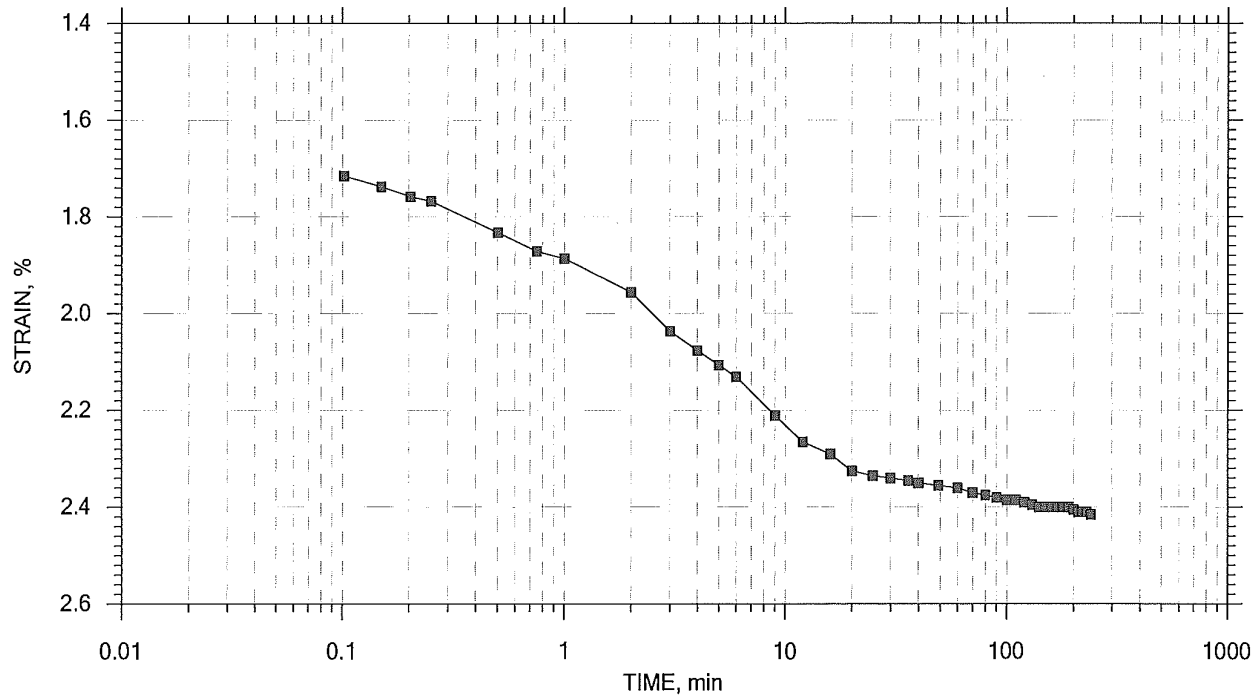
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 13

Stress: 0.5 tsf



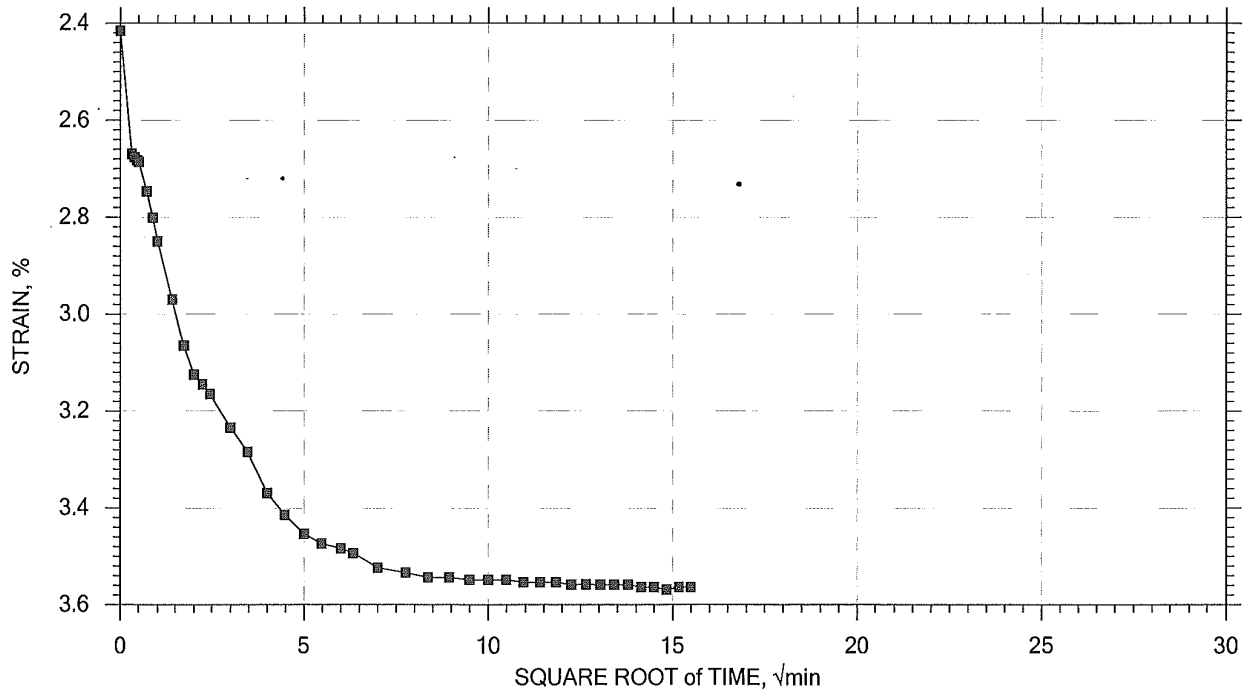
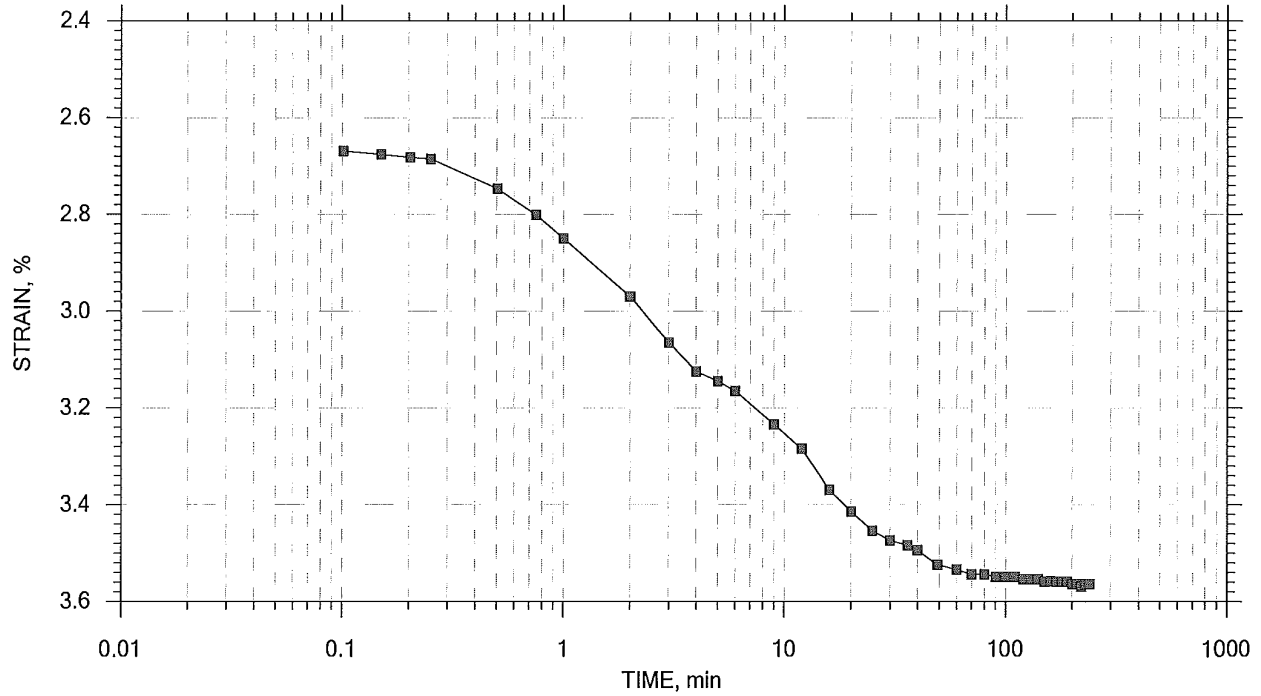
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 13

Stress: 1 tsf



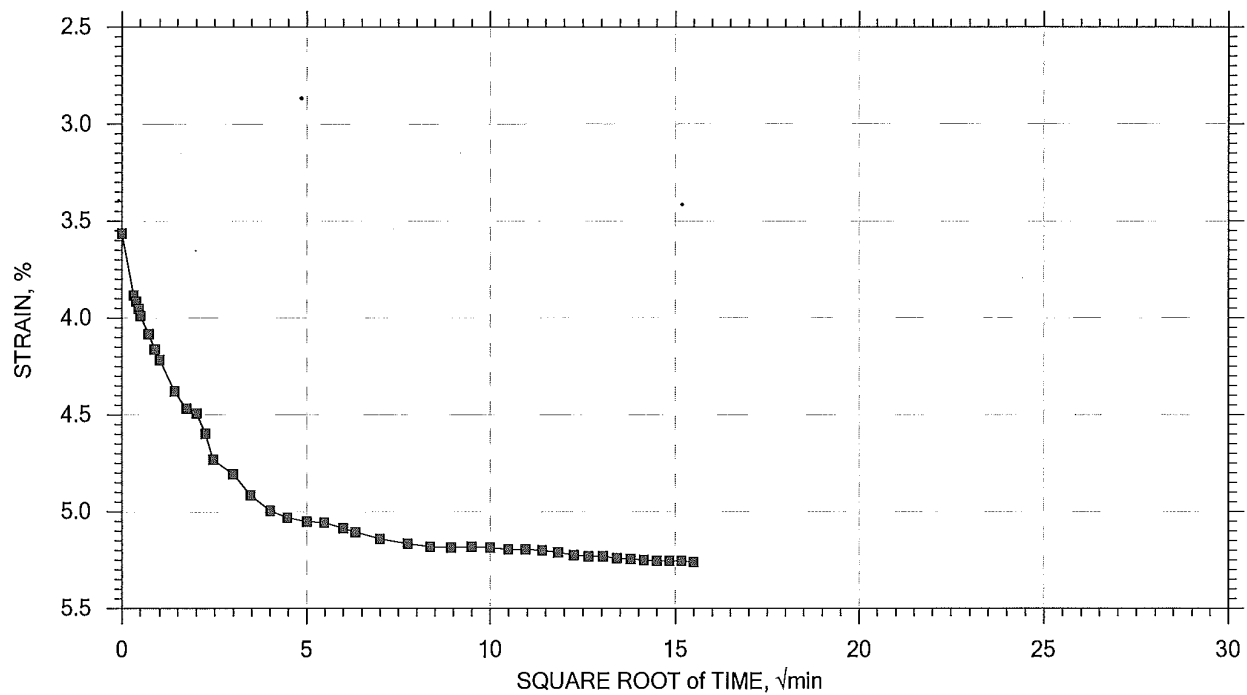
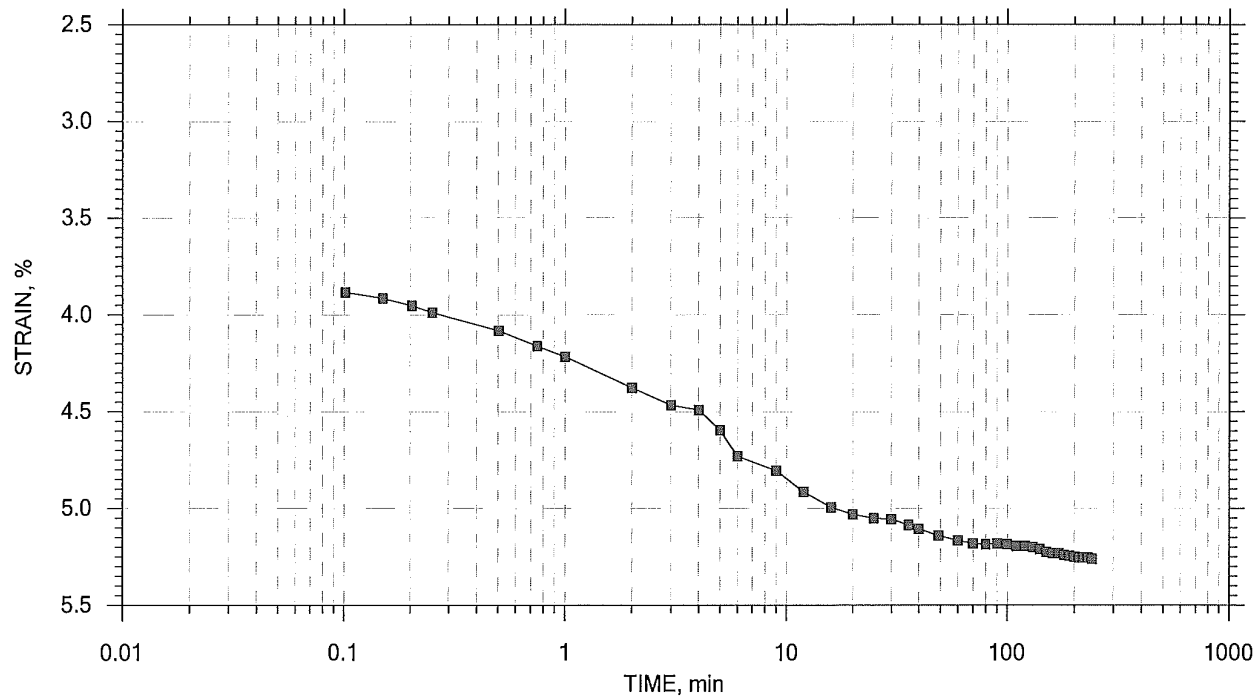
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 13

Stress: 2 tsf



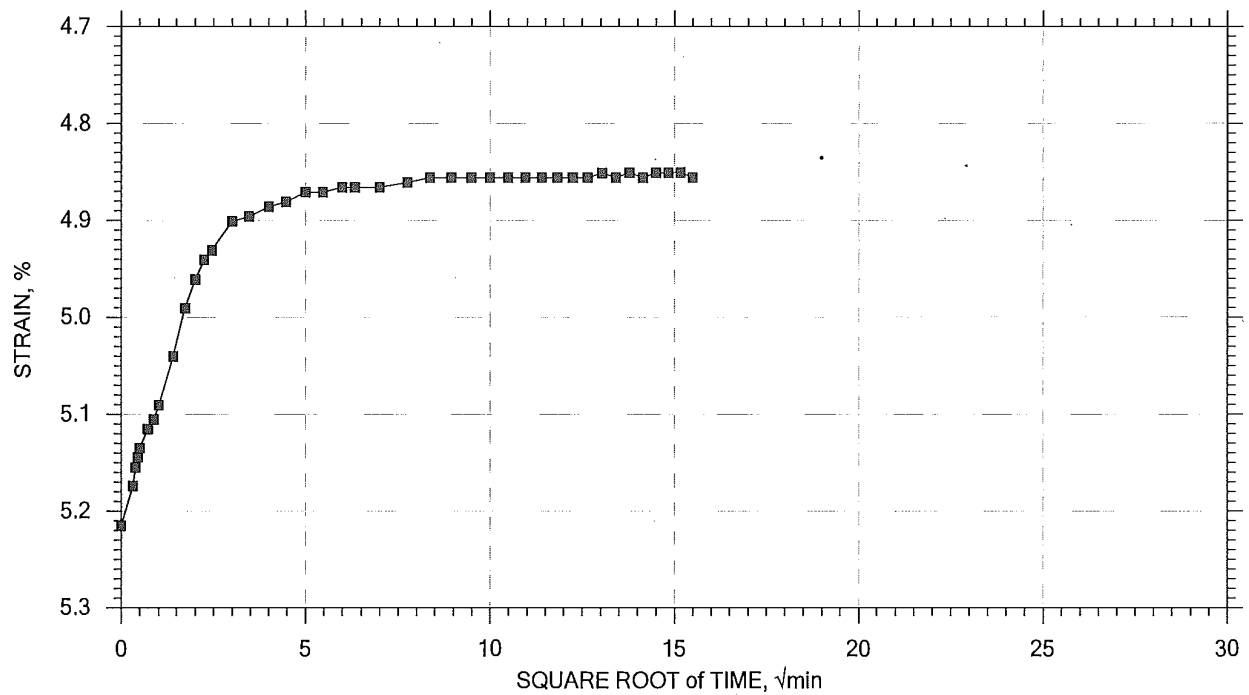
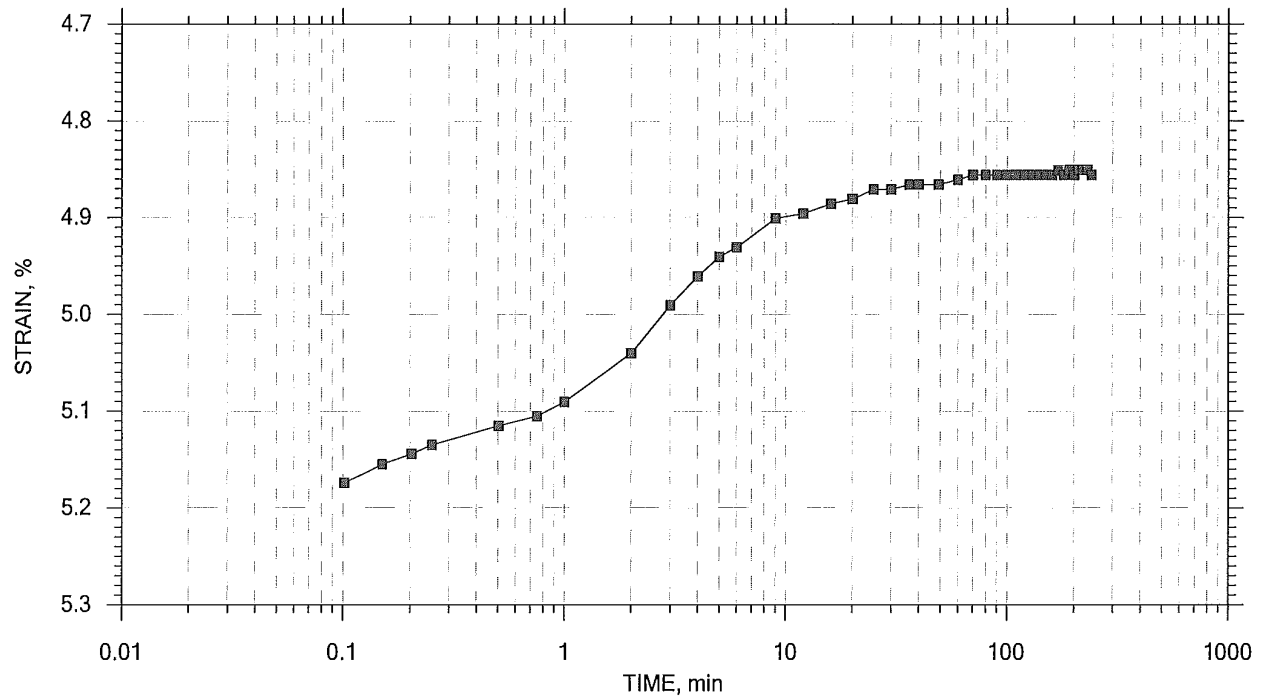
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 13

Stress: 1 tsf



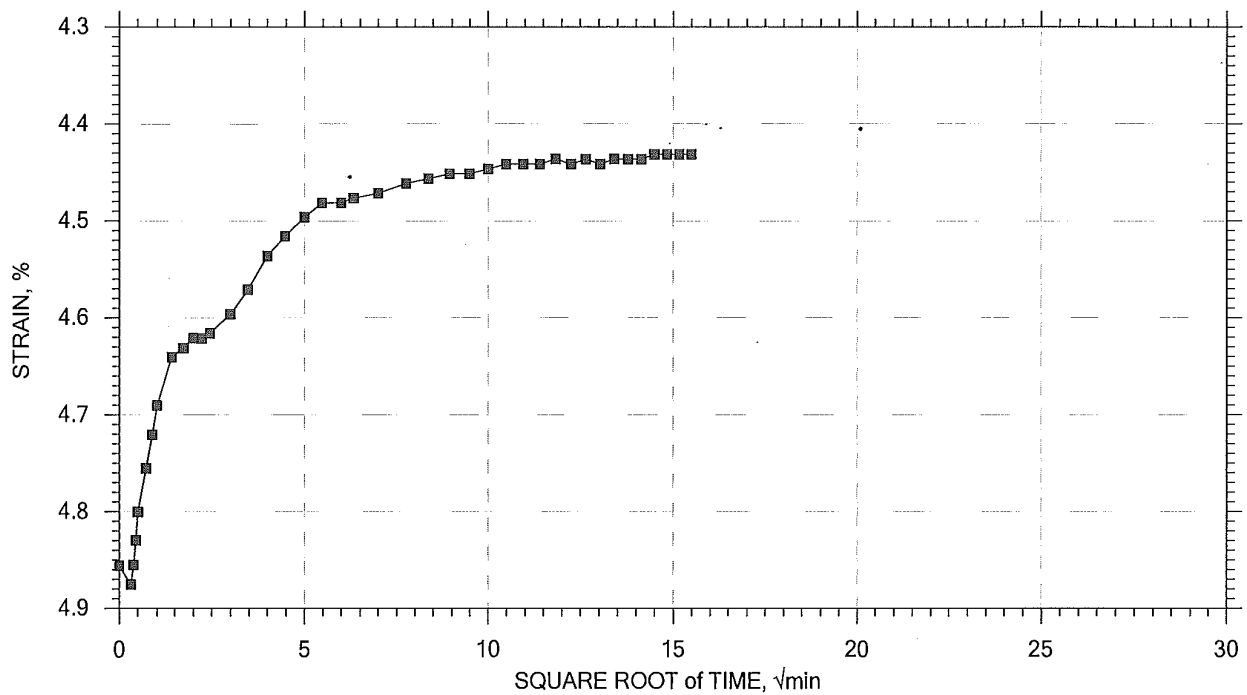
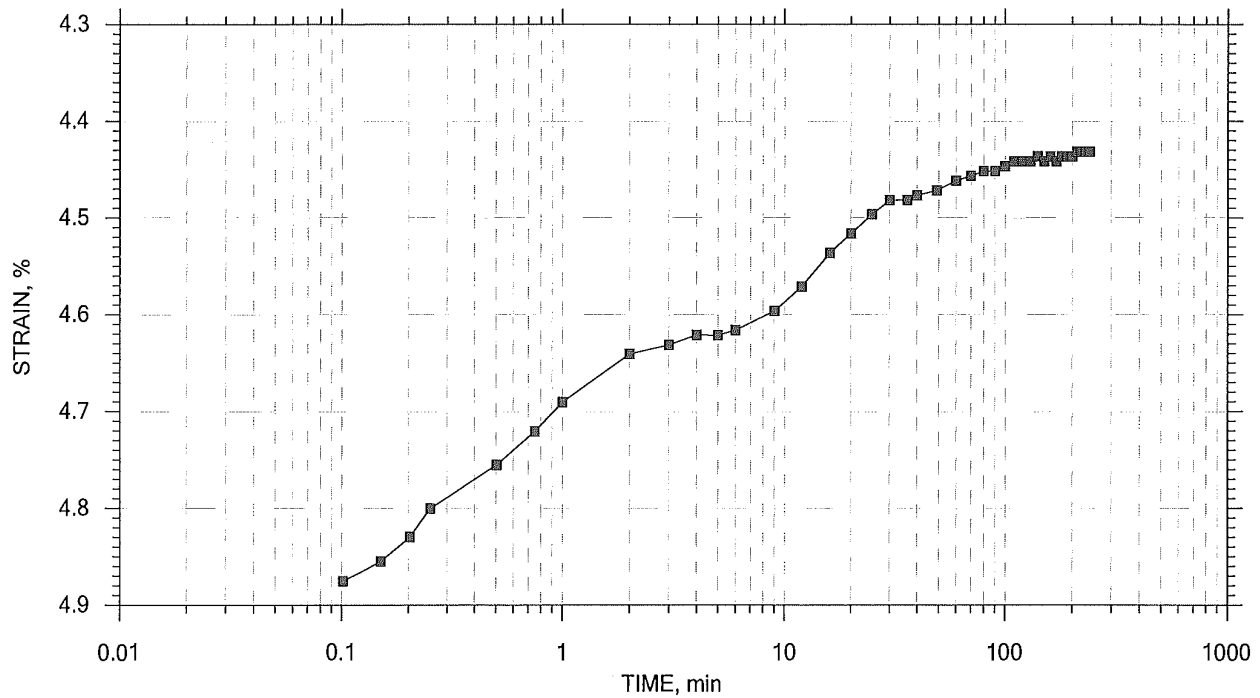
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 13

Stress: 0.5 tsf



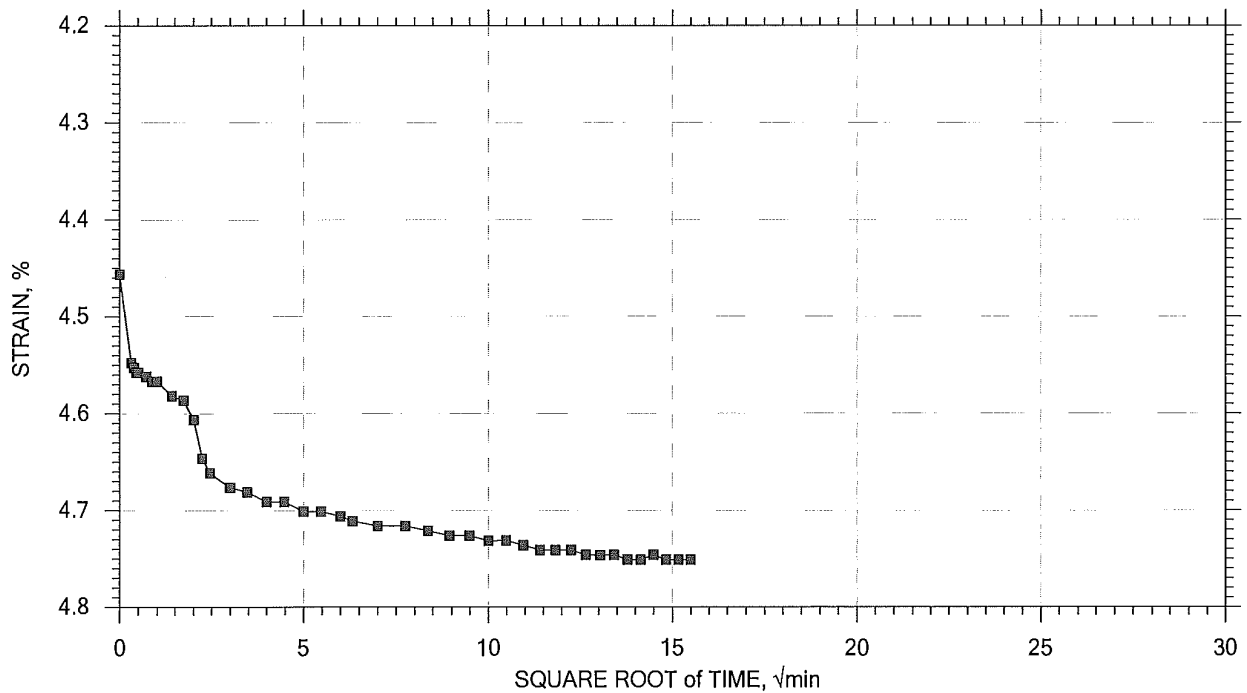
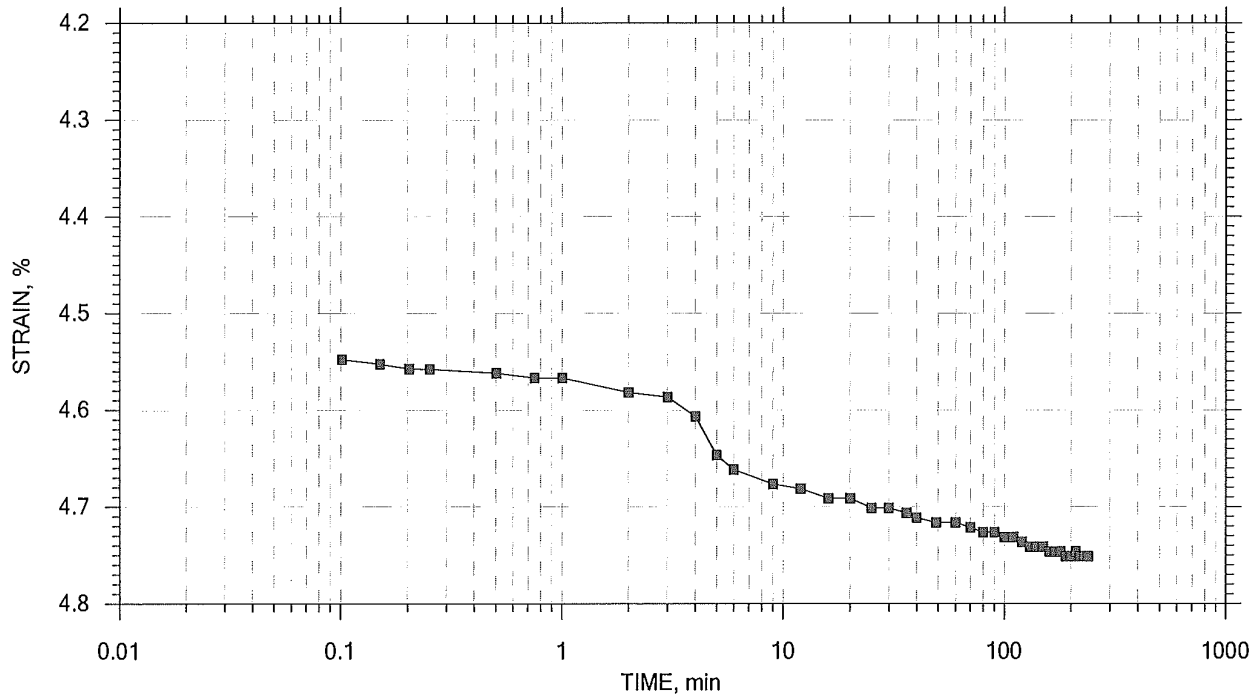
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	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 13

Stress: 1 tsf



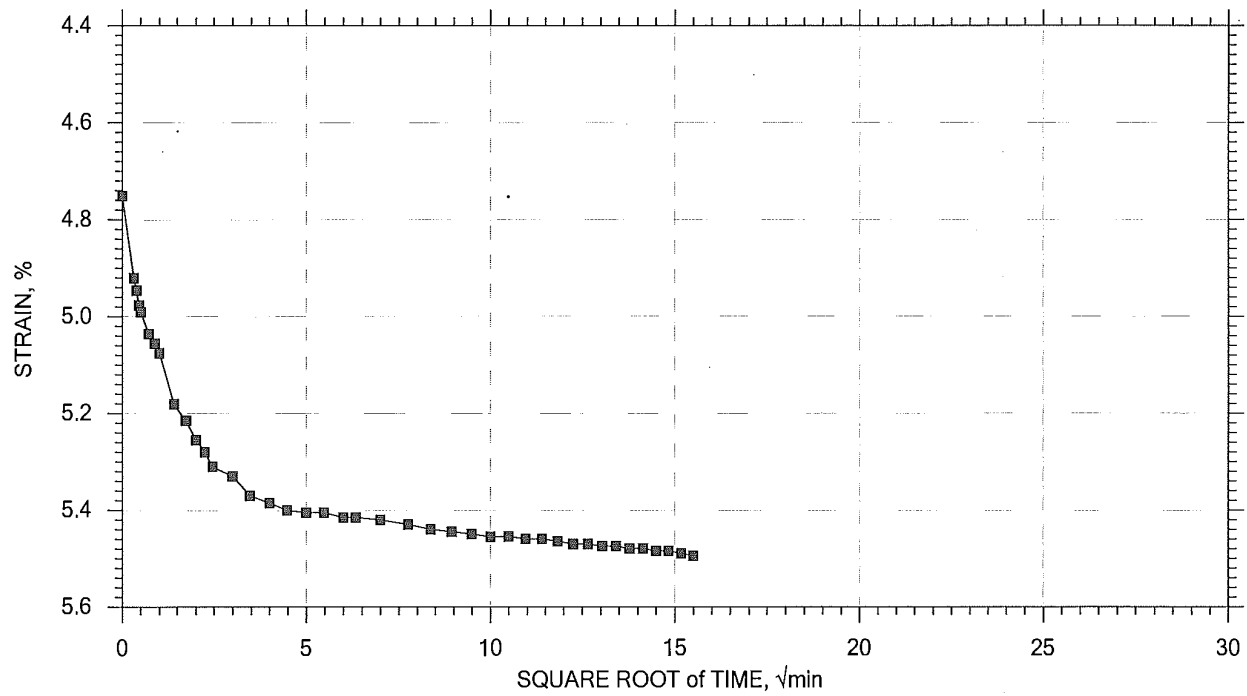
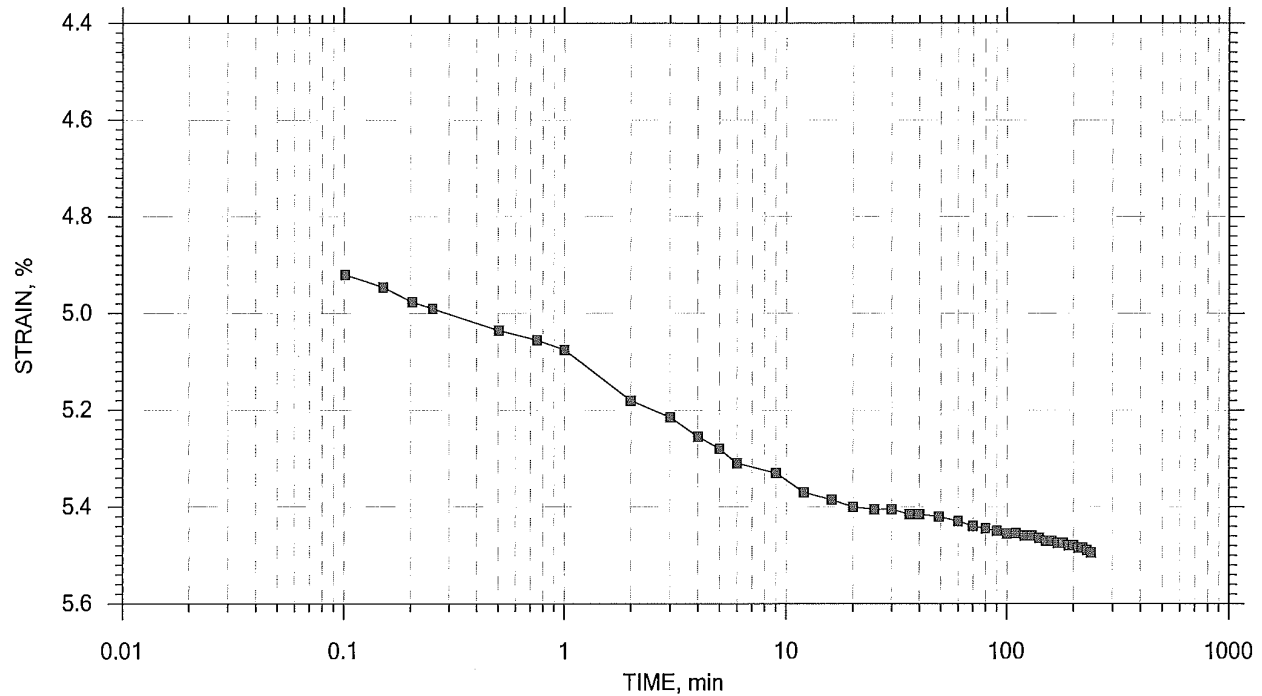
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 13

Stress: 2 tsf



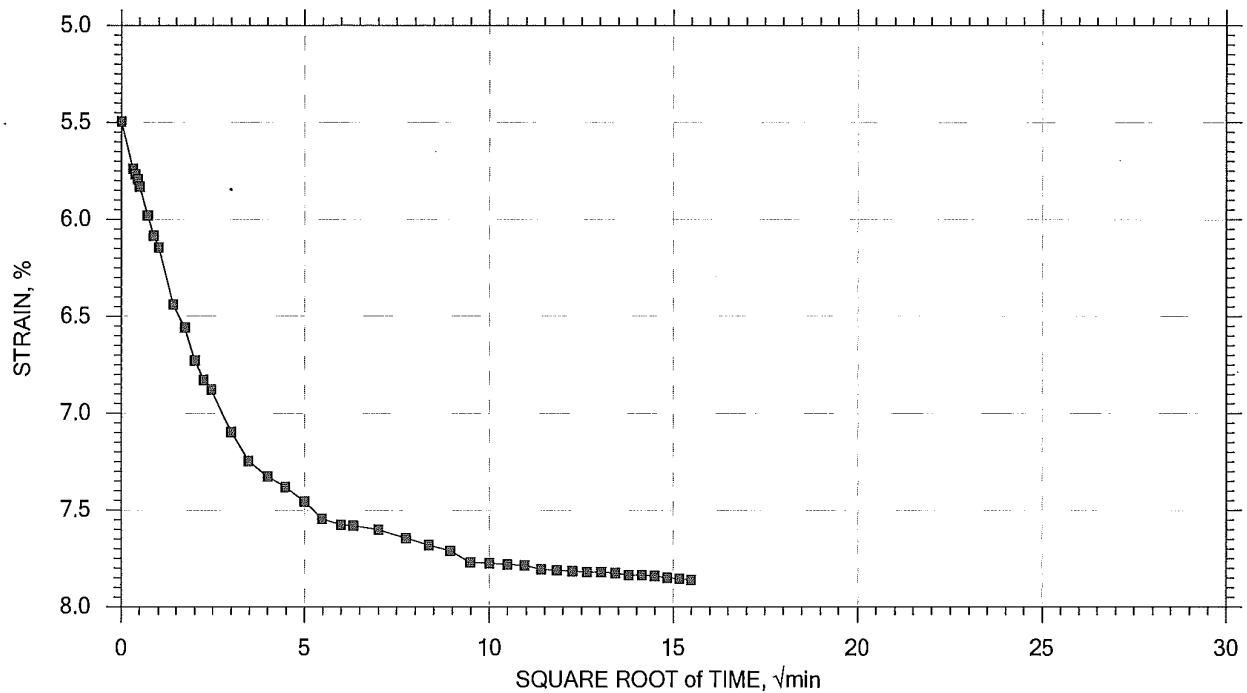
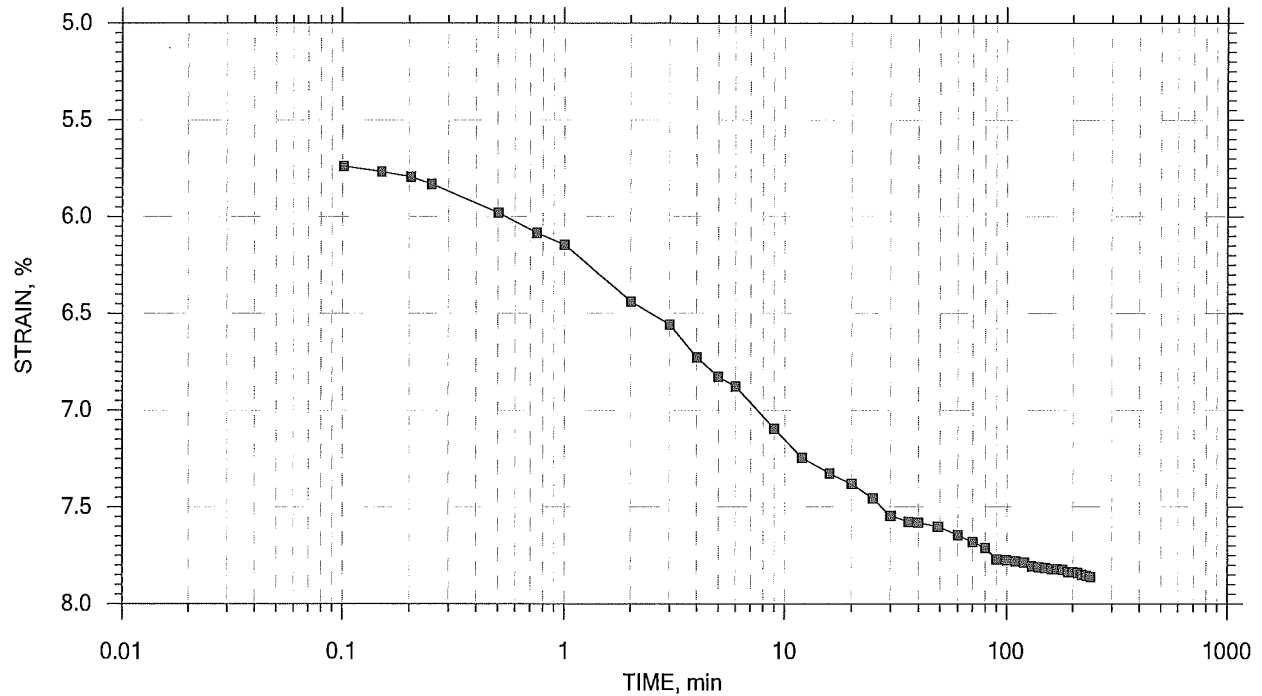
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	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 13

Stress: 4 tsf



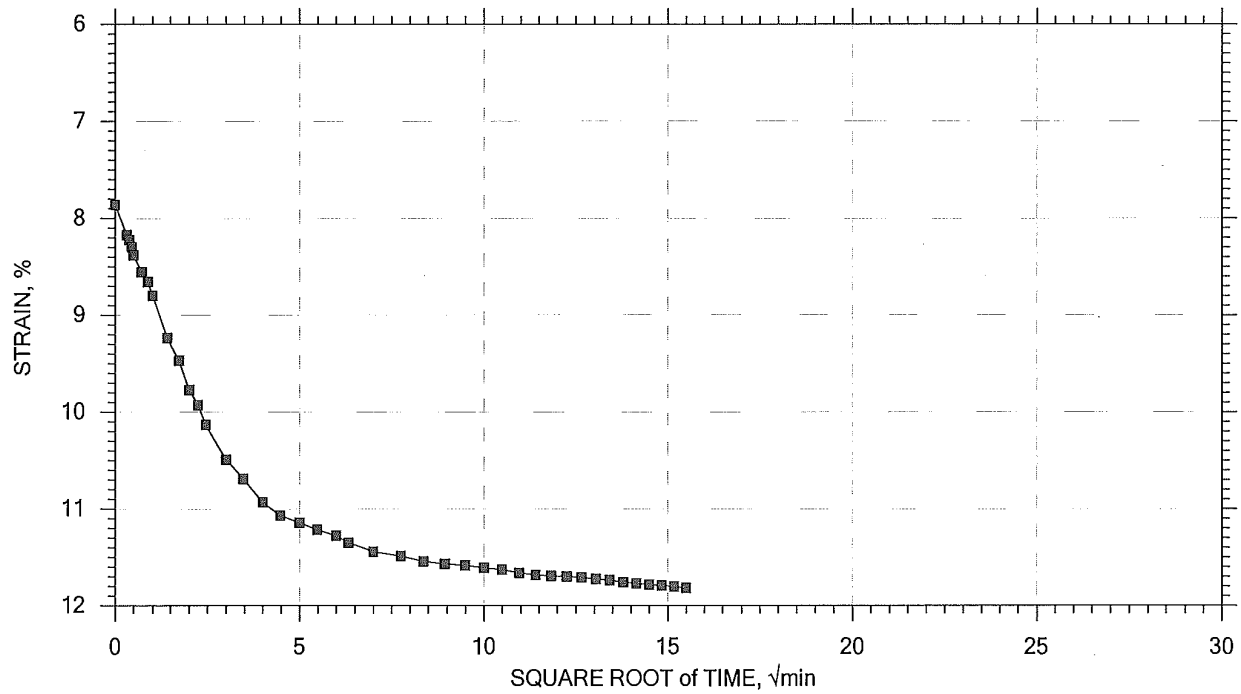
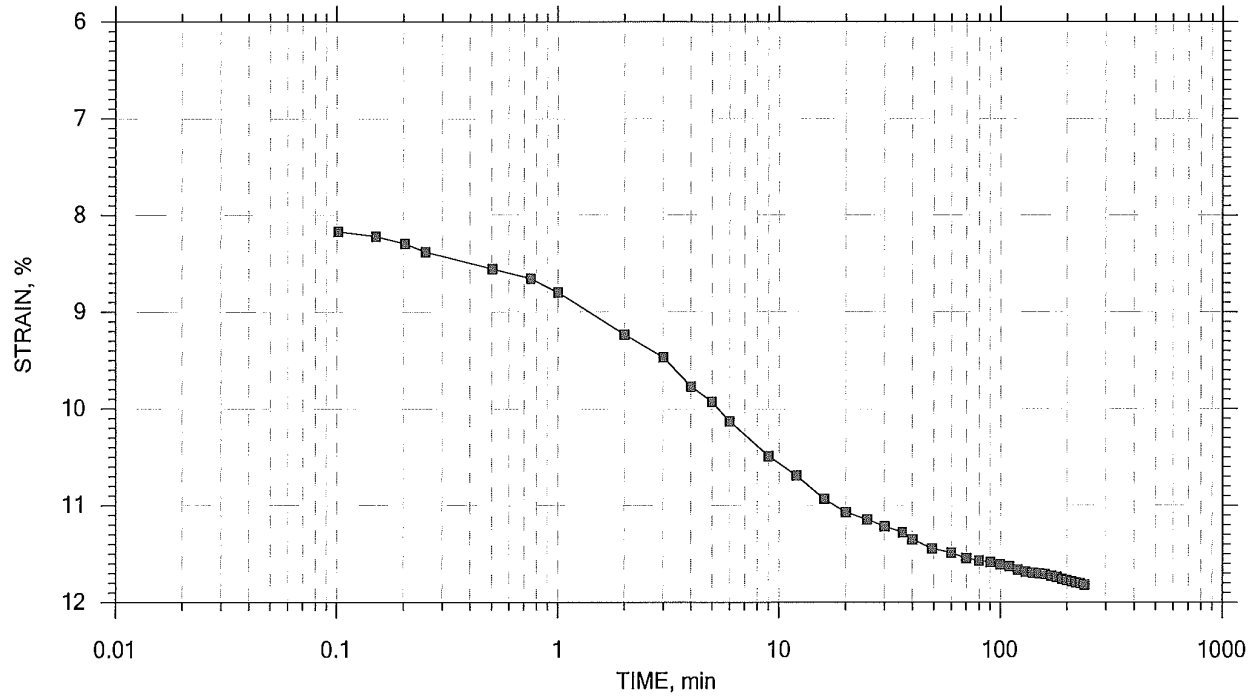
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	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 13

Stress: 8 tsf



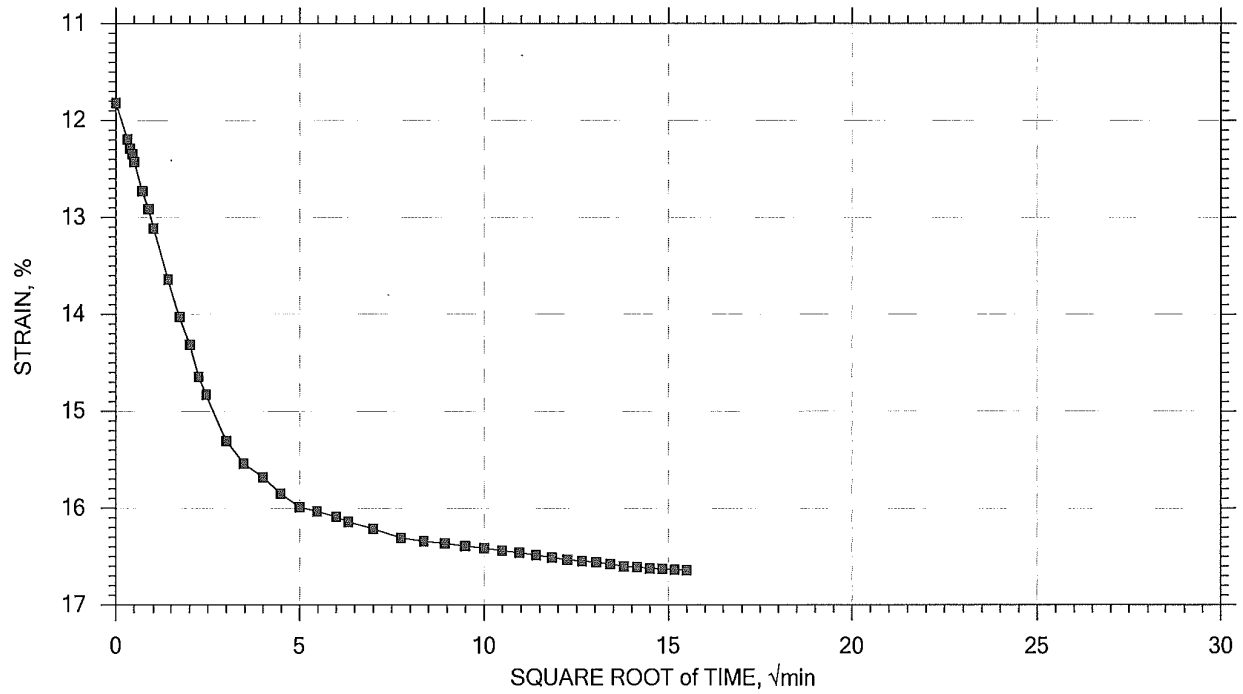
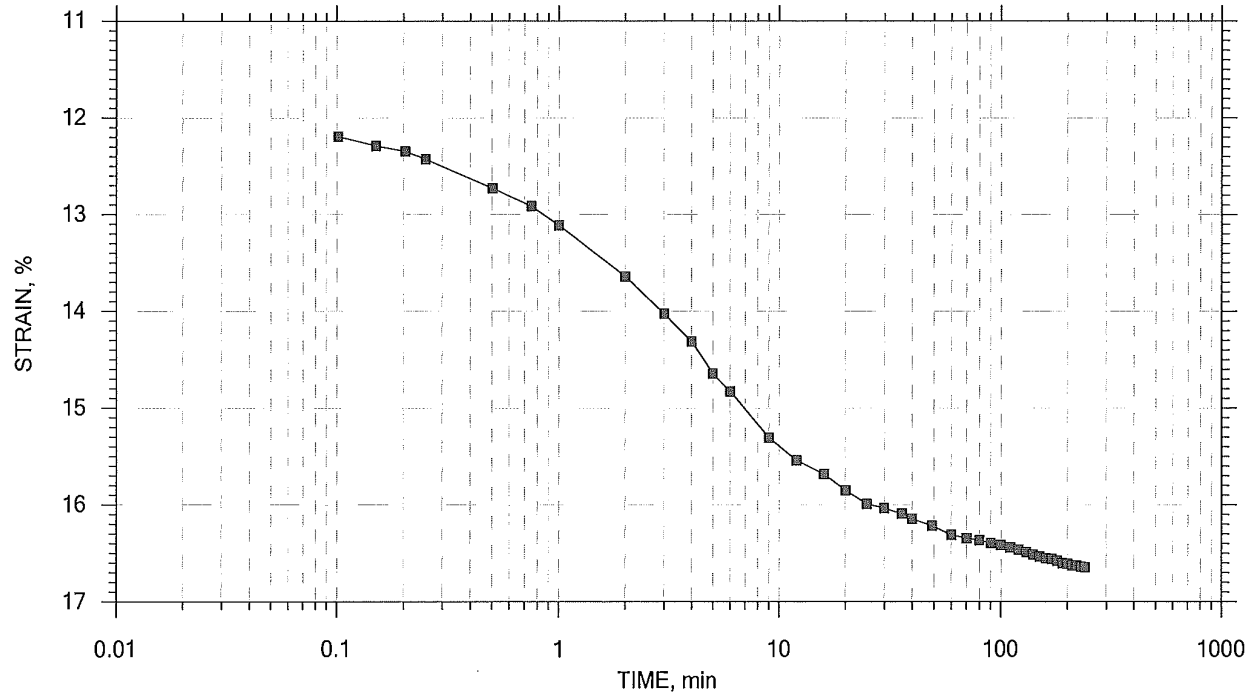
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	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 13

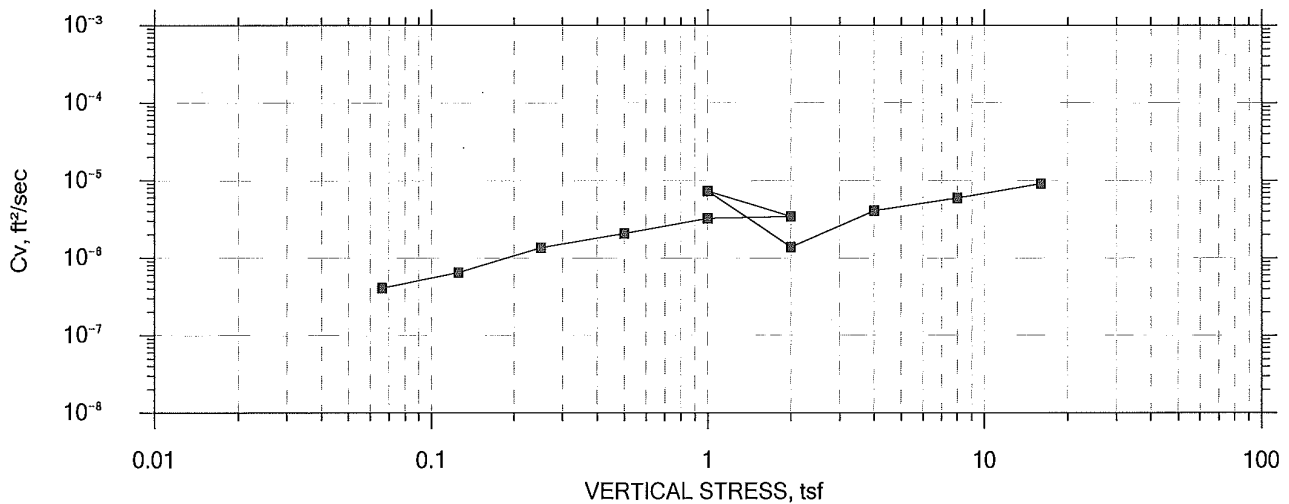
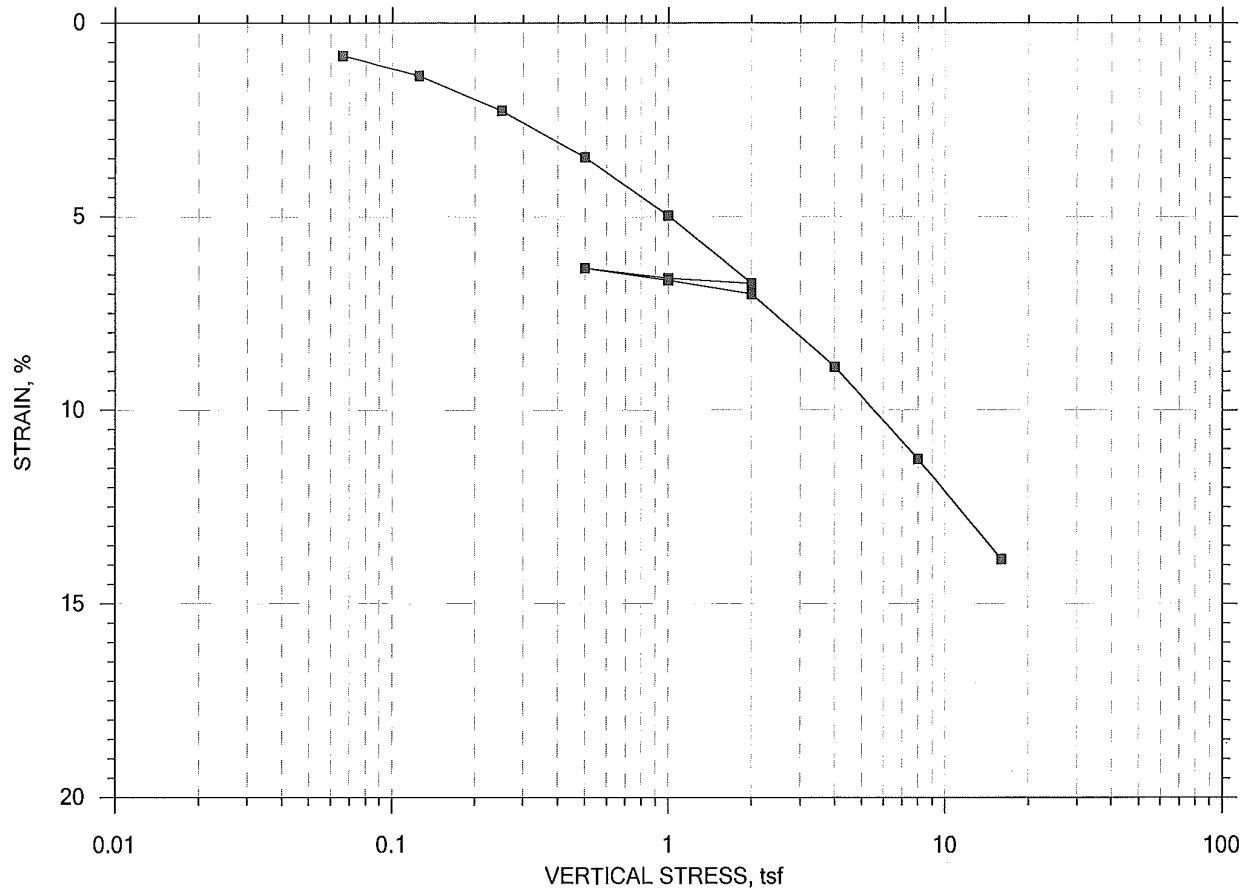
Stress: 16 tsf




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-1	Test Date: 01/23/14	Test No.: IP-6
	Depth: 29-31 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		

One-Dimensional Consolidation by ASTM D2435 - Method B

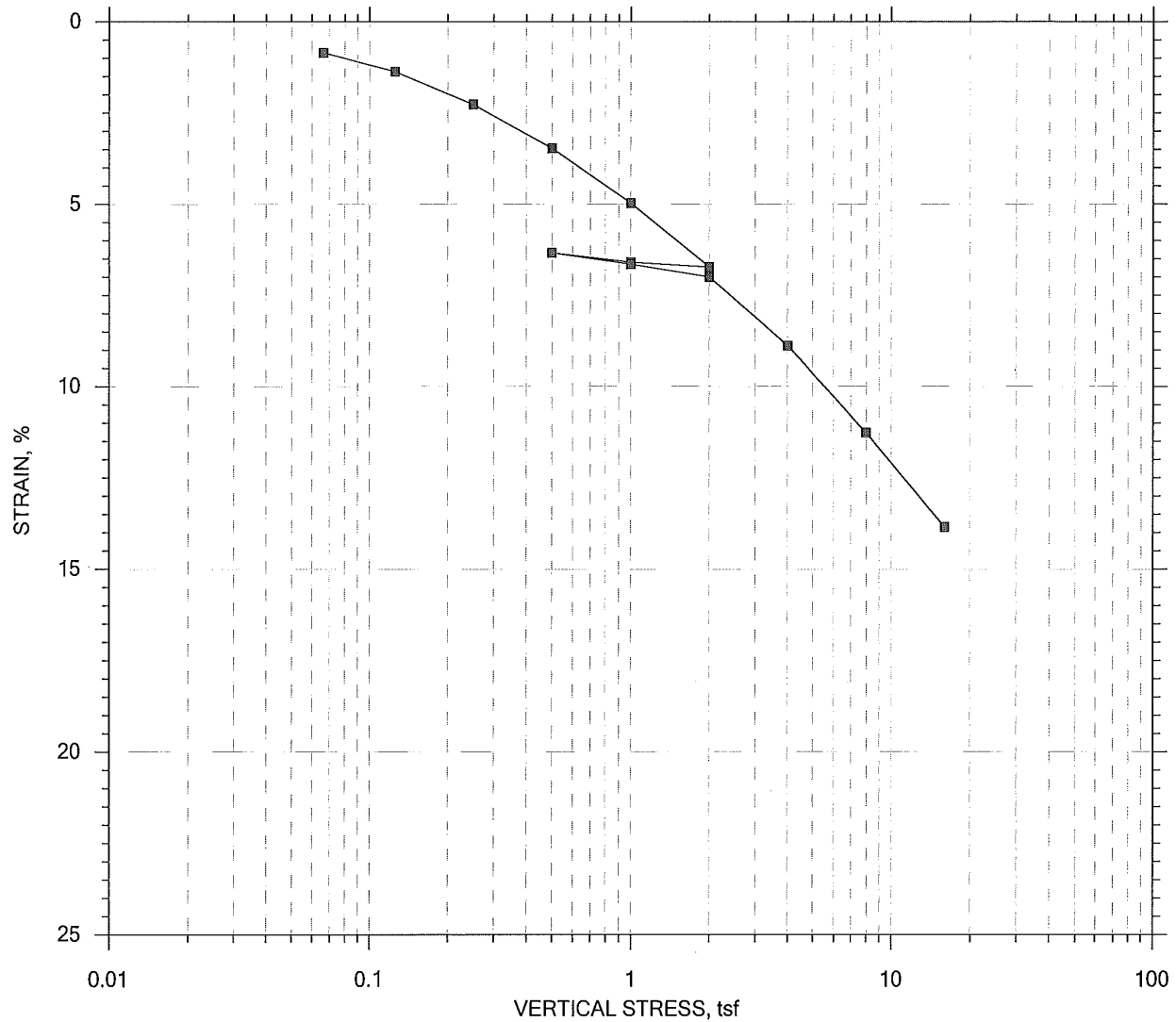
SUMMARY REPORT




	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



				Before Test	After Test	
Current Vertical Effective Stress: ---				Water Content, %	23.65	16.99
Preconsolidation Stress: ---				Dry Unit Weight, pcf	102.77	116.78
Compression Ratio: ---				Saturation, %	97.41	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	0.67	0.47
LL: ---	PL: ---	PI: ---	GS: 2.74			

	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		
	Displacement at End of Increment		

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-51
Sample No.: OT-2
Test No.: IP-7

Location: Chelsea, MA
Tested By: md
Test Date: 01/24/14
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 64-66 ft
Elevation: ---

Soil Description: Moist, greenish gray clay with sand
Remarks: System T

Estimated Specific Gravity: 2.74
Initial Void Ratio: 0.666
Final Void Ratio: 0.466

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.88 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	11252	RING		12367
Wt. Container + Wet Soil, gm	358.26	273.72	264.90	162.94
Wt. Container + Dry Soil, gm	277.48	242.40	242.40	140.47
Wt. Container, gm	7.6000	109.98	109.98	8.2400
Wt. Dry Soil, gm	269.88	132.42	132.42	132.23
Water Content, %	29.93	23.65	16.99	16.99
Void Ratio	---	0.666	0.466	---
Degree of Saturation, %	---	97.41	100.00	---
Dry Unit Weight, pcf	---	102.77	116.78	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Project No. 604428

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Silverline
Boring No.: B-51
Sample No.: OT-2
Test No.: IP-7

Location: Chelsea, MA
Tested By: md
Test Date: 01/24/14
Sample Type: intact

Project No.: GTX-301232
Checked By: jdt
Depth: 64-66 ft
Elevation: ---

Soil Description: Moist, greenish gray clay with sand
Remarks: System T

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	
1	0.0664	0.008514	0.652	0.851	57.542	4.23e-007	1.28e-001	1.46e-004	
2	0.125	0.01367	0.643	1.37	38.812	6.18e-007	8.80e-002	1.47e-004	
3	0.250	0.02265	0.628	2.26	16.888	1.40e-006	7.18e-002	2.71e-004	
4	0.500	0.03469	0.608	3.47	10.737	2.16e-006	4.82e-002	2.80e-004	
5	1.00	0.04973	0.583	4.97	6.889	3.27e-006	3.01e-002	2.65e-004	
6	2.00	0.06723	0.554	6.72	6.905	3.15e-006	1.75e-002	1.49e-004	
7	1.00	0.06591	0.556	6.59	1.283	1.67e-005	1.32e-003	5.94e-005	
8	0.500	0.06331	0.560	6.33	0.892	2.41e-005	5.20e-003	3.38e-004	
9	1.00	0.06646	0.555	6.65	3.864	5.55e-006	6.31e-003	9.45e-005	
10	2.00	0.06998	0.549	7.00	20.418	1.04e-006	3.52e-003	9.91e-006	
11	4.00	0.08876	0.518	8.88	4.957	4.20e-006	9.39e-003	1.06e-004	
12	8.00	0.1126	0.478	11.3	2.953	6.72e-006	5.97e-003	1.08e-004	
13	16.0	0.1385	0.435	13.8	2.664	7.04e-006	3.23e-003	6.14e-005	

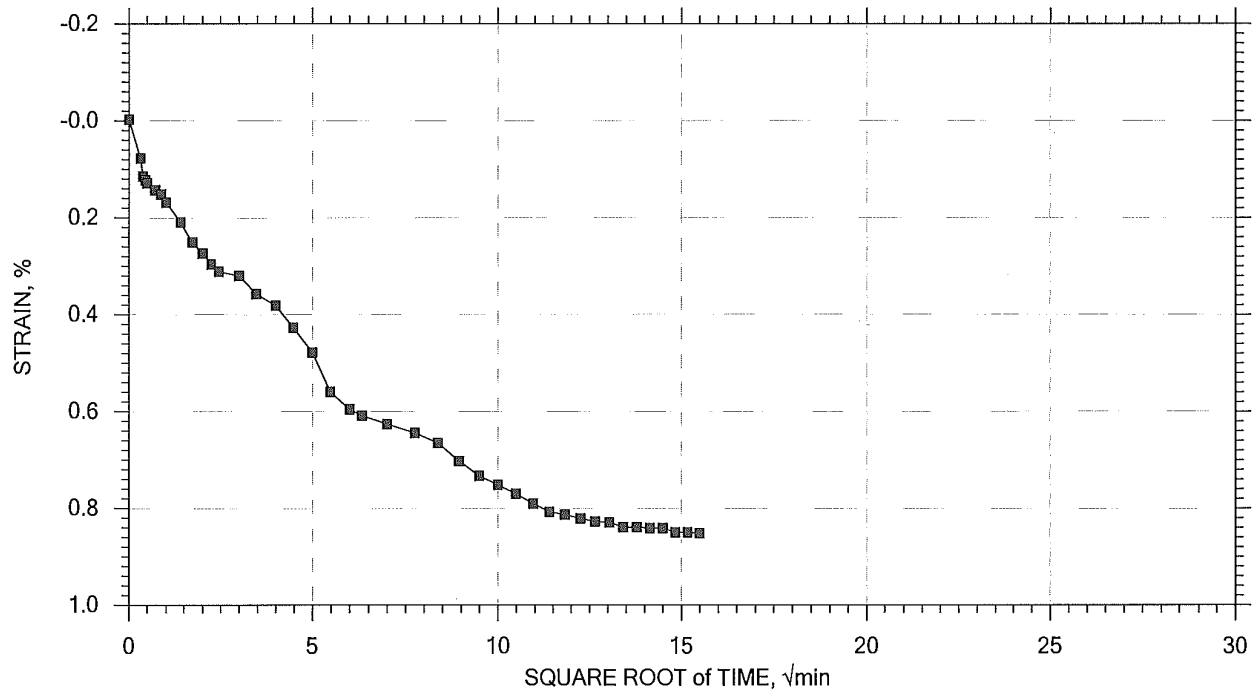
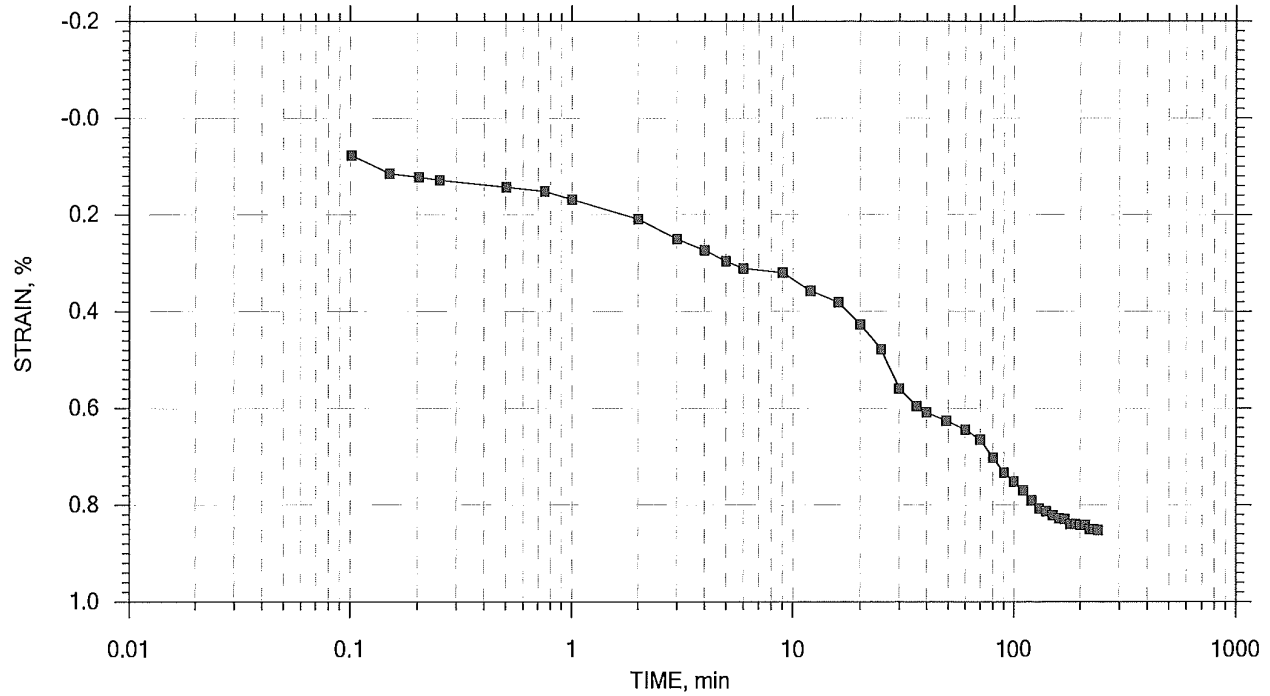
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft ² /sec	Mv 1/tsf	k ft/day	Ca %
1	0.0664	0.008514	0.652	0.851	0.000	0.00e+000	1.28e-001	0.00e+000	0.00e+000
2	0.125	0.01367	0.643	1.37	0.000	0.00e+000	8.80e-002	0.00e+000	0.00e+000
3	0.250	0.02265	0.628	2.26	4.206	1.31e-006	7.18e-002	2.53e-004	0.00e+000
4	0.500	0.03469	0.608	3.47	2.571	2.09e-006	4.82e-002	2.72e-004	0.00e+000
5	1.00	0.04973	0.583	4.97	1.755	2.98e-006	3.01e-002	2.42e-004	0.00e+000
6	2.00	0.06723	0.554	6.72	1.487	3.40e-006	1.75e-002	1.60e-004	0.00e+000
7	1.00	0.06591	0.556	6.59	0.000	0.00e+000	1.32e-003	0.00e+000	0.00e+000
8	0.500	0.06331	0.560	6.33	0.000	0.00e+000	5.20e-003	0.00e+000	0.00e+000
9	1.00	0.06646	0.555	6.65	0.000	0.00e+000	6.31e-003	0.00e+000	0.00e+000
10	2.00	0.06998	0.549	7.00	0.000	0.00e+000	3.52e-003	0.00e+000	0.00e+000
11	4.00	0.08876	0.518	8.88	1.345	3.59e-006	9.39e-003	9.09e-005	0.00e+000
12	8.00	0.1126	0.478	11.3	0.910	5.07e-006	5.97e-003	8.16e-005	0.00e+000
13	16.0	0.1385	0.435	13.8	0.426	1.02e-005	3.23e-003	8.91e-005	0.00e+000


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Volume Step 1 of 13

Stress: 0.066354 tsf



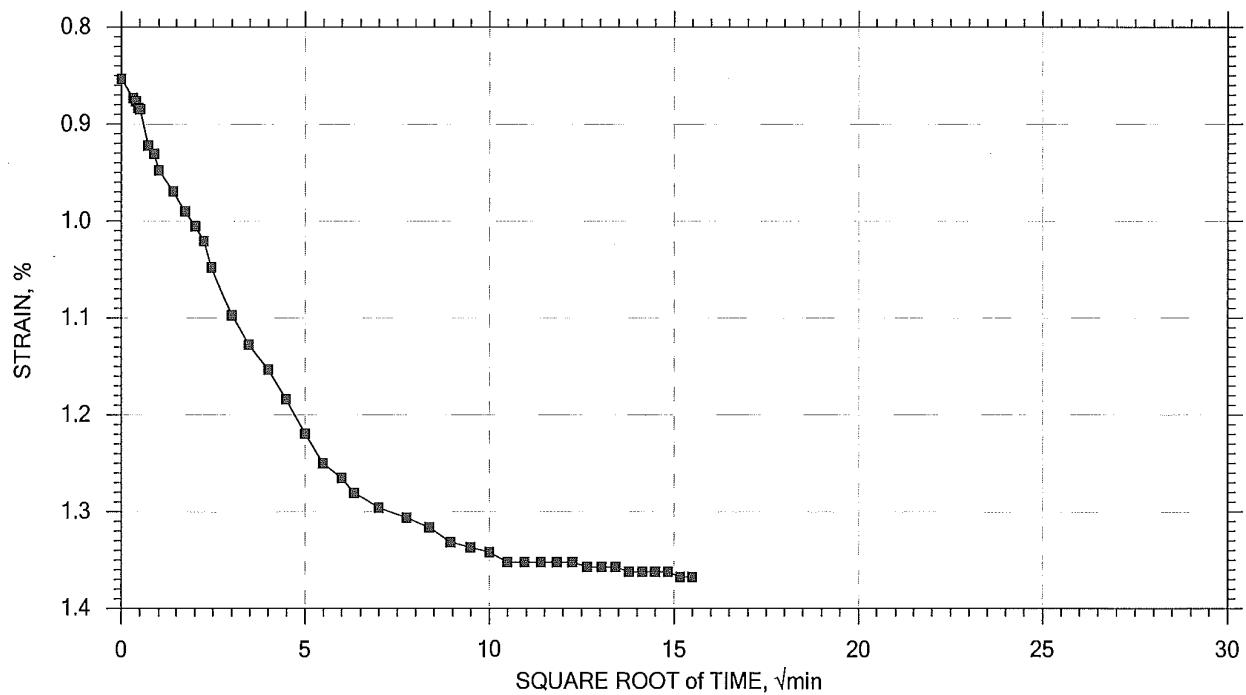
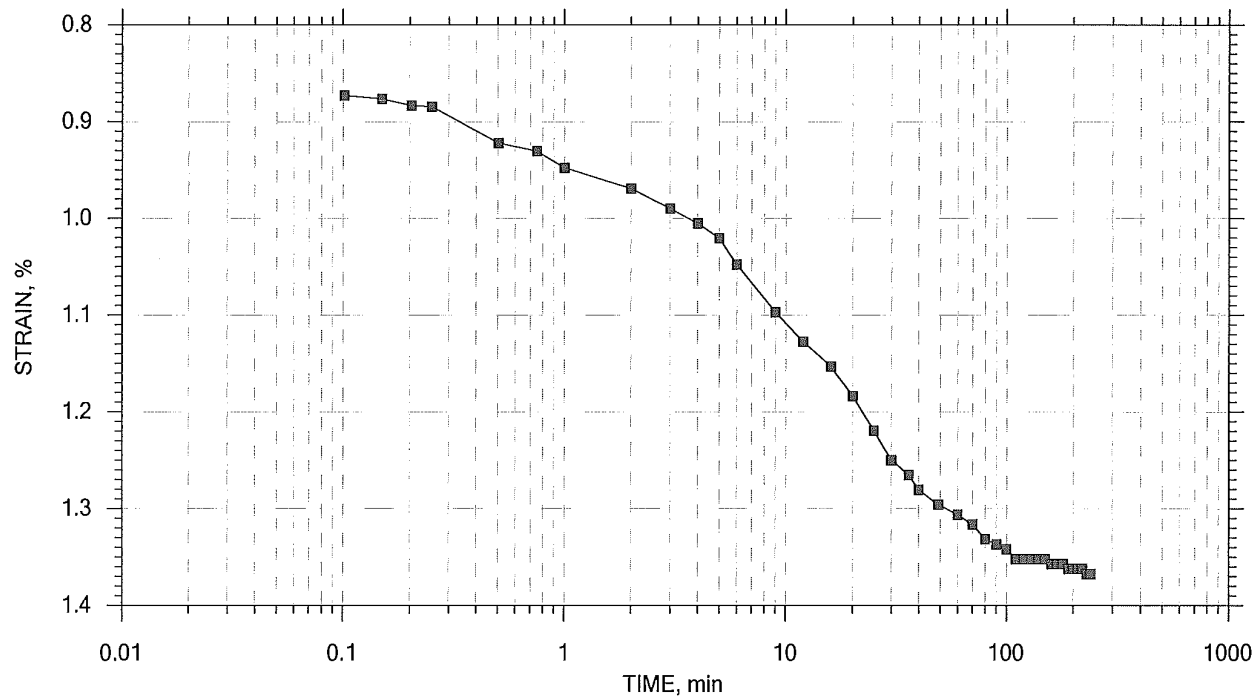
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 2 of 13

Stress: 0.125 tsf



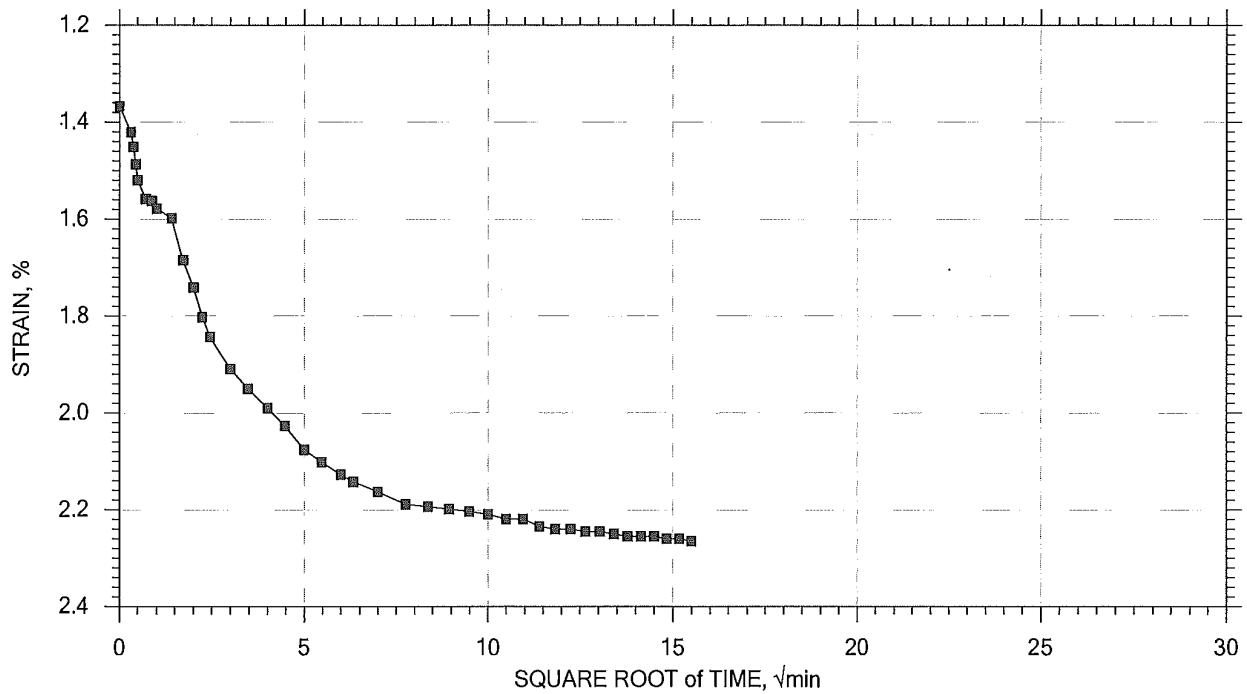
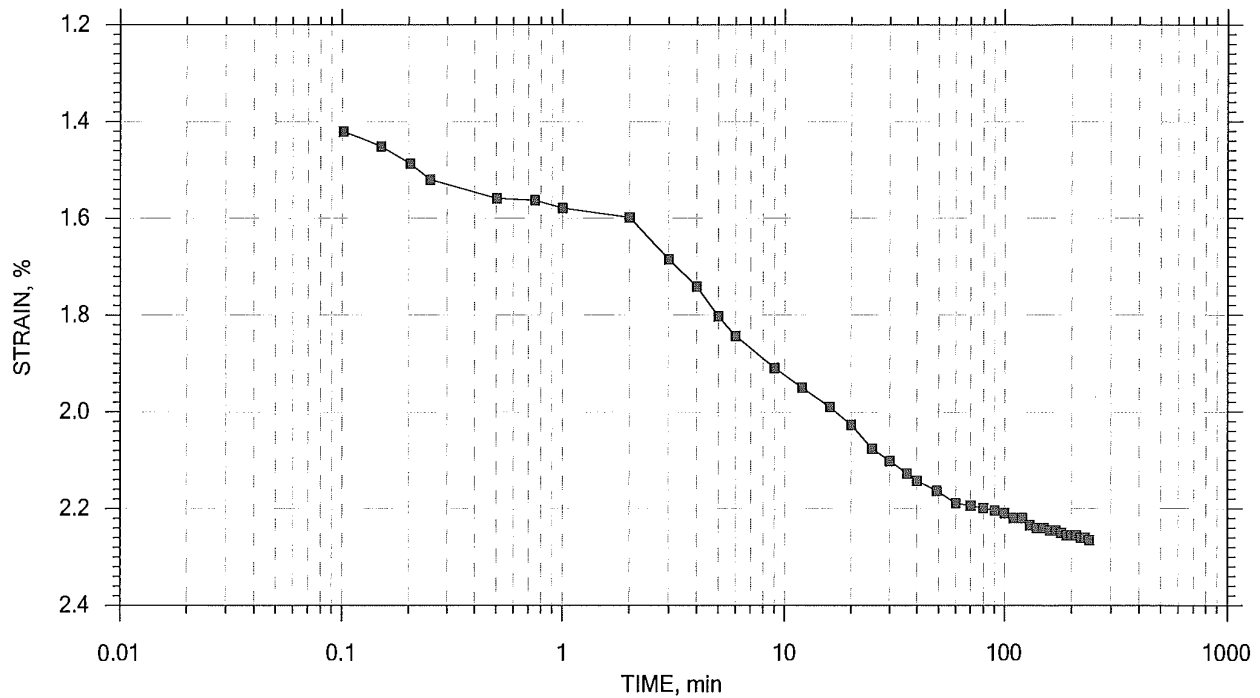
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 3 of 13

Stress: 0.25 tsf



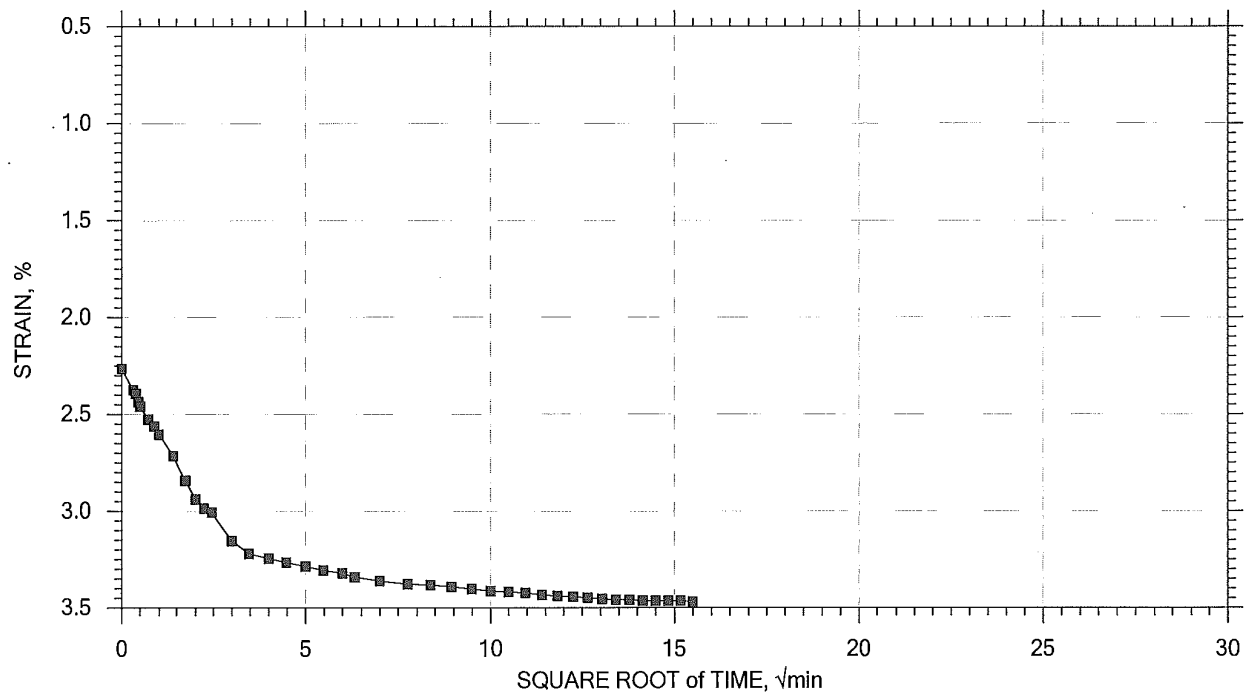
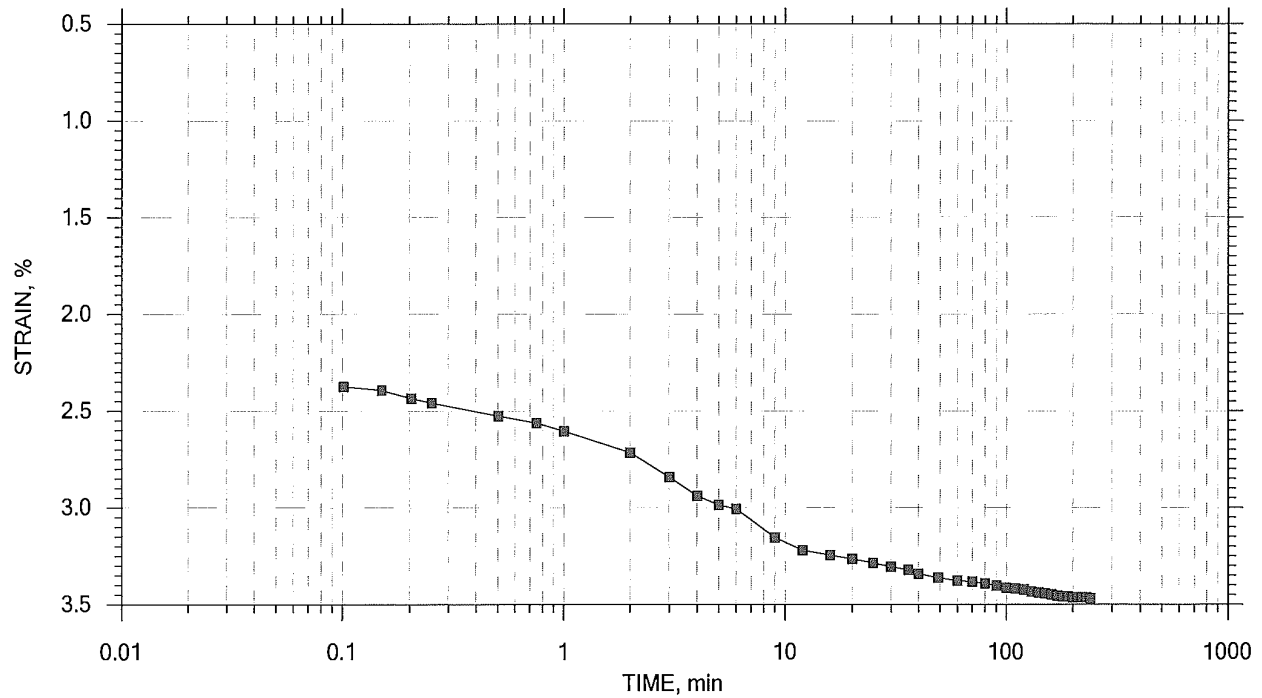
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 4 of 13

Stress: 0.5 tsf



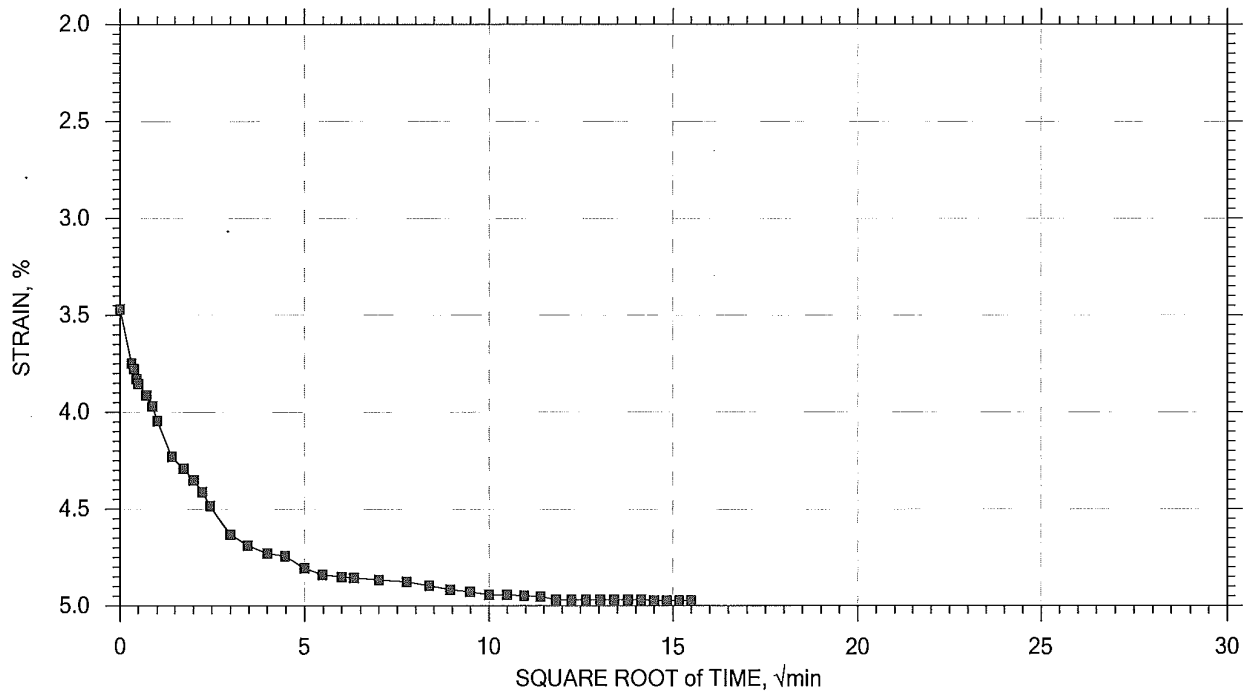
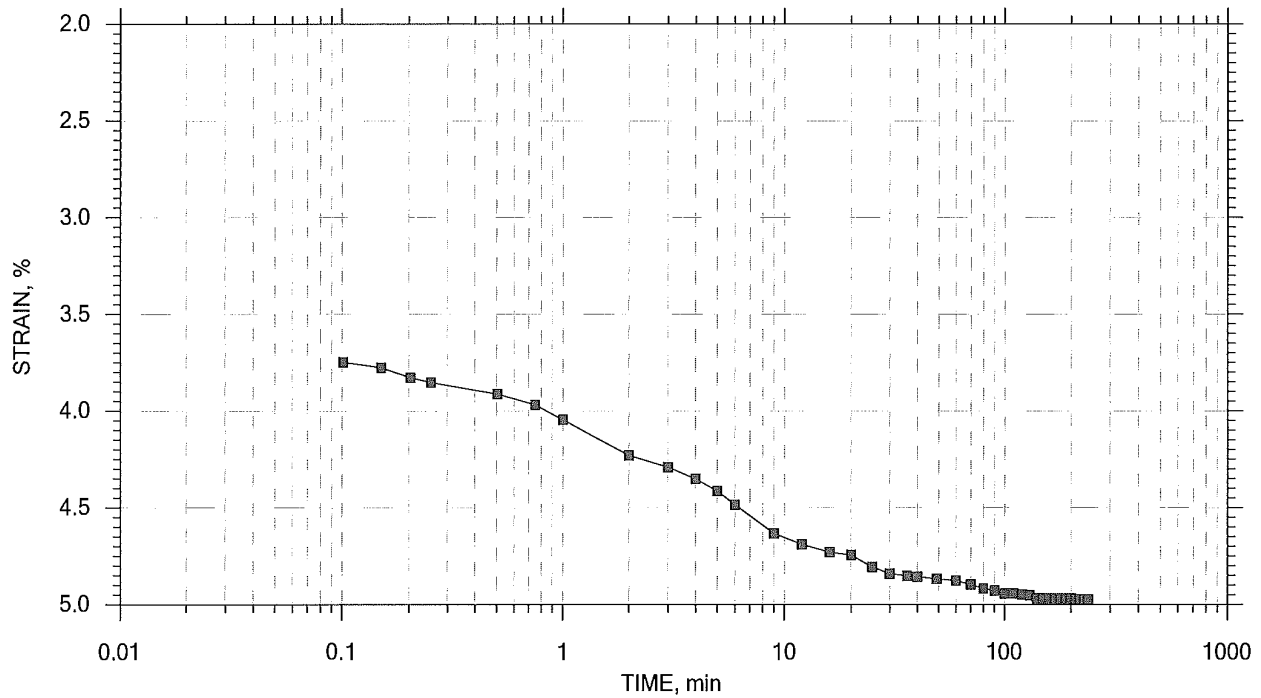
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 5 of 13

Stress: 1 tsf



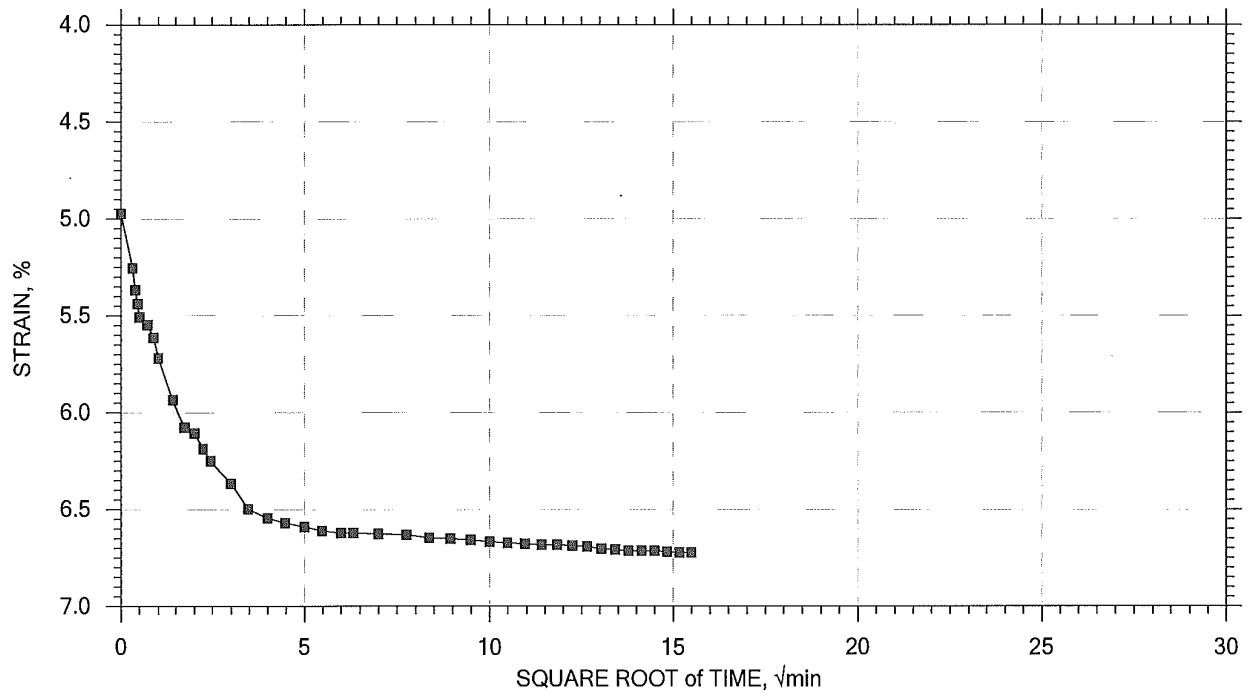
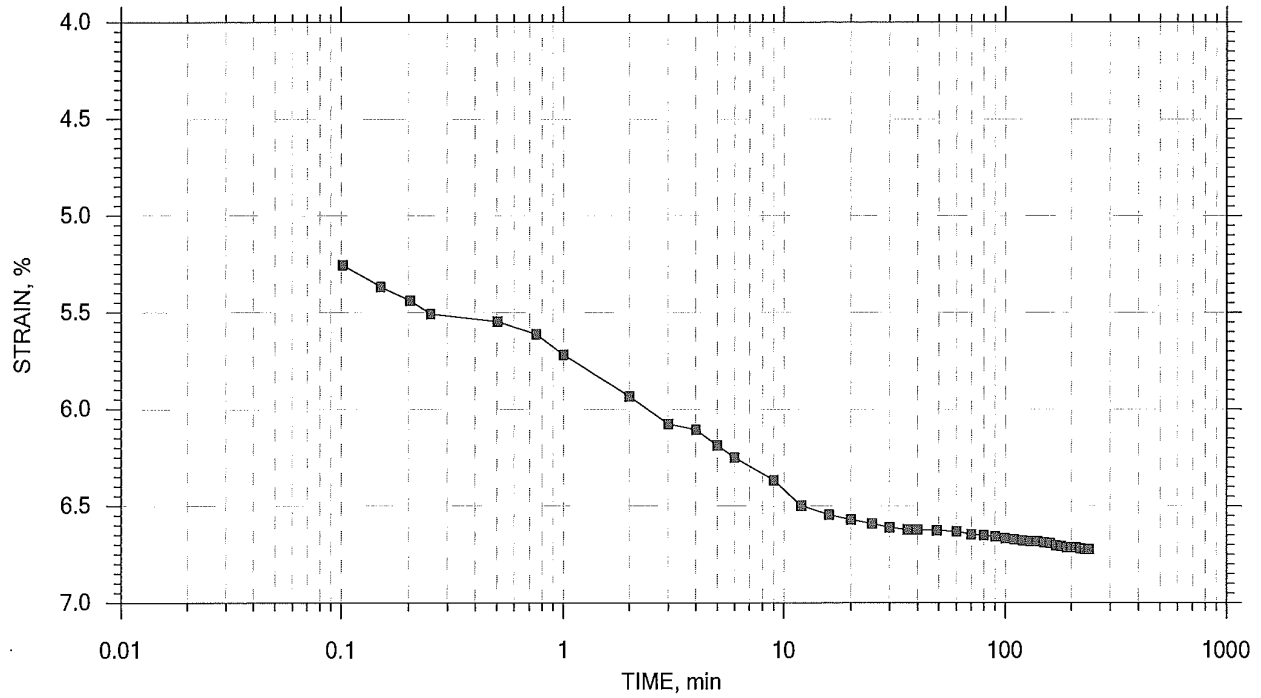
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	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 6 of 13

Stress: 2 tsf



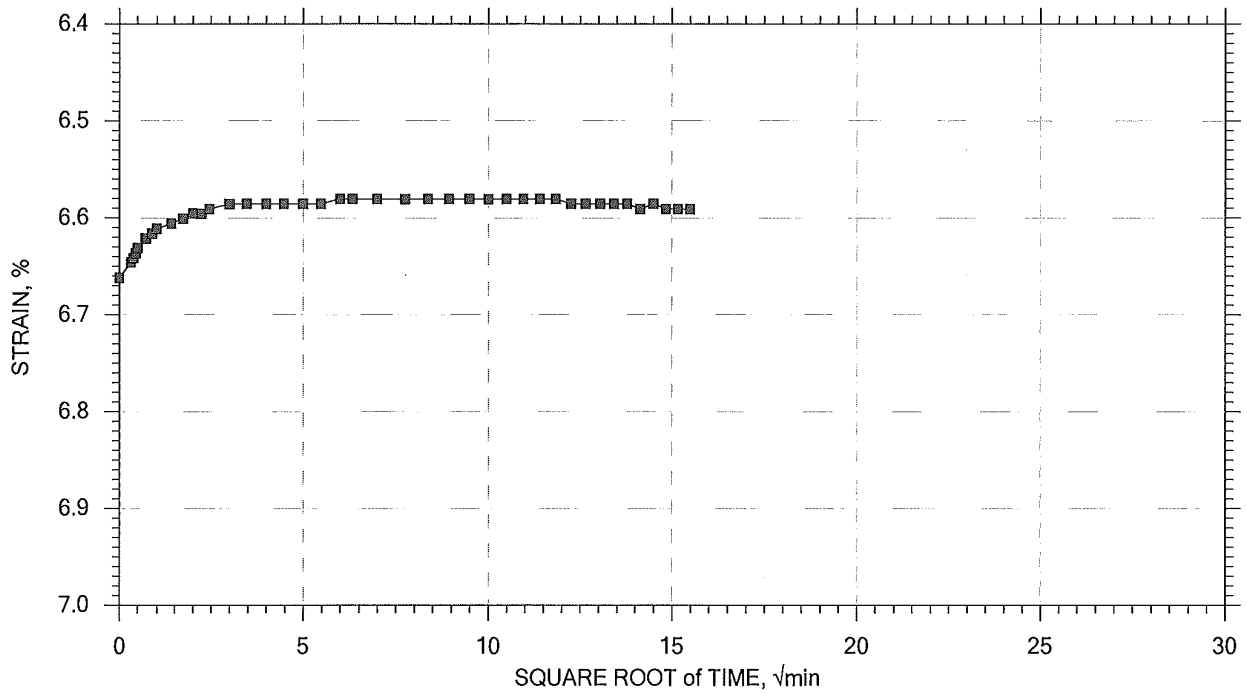
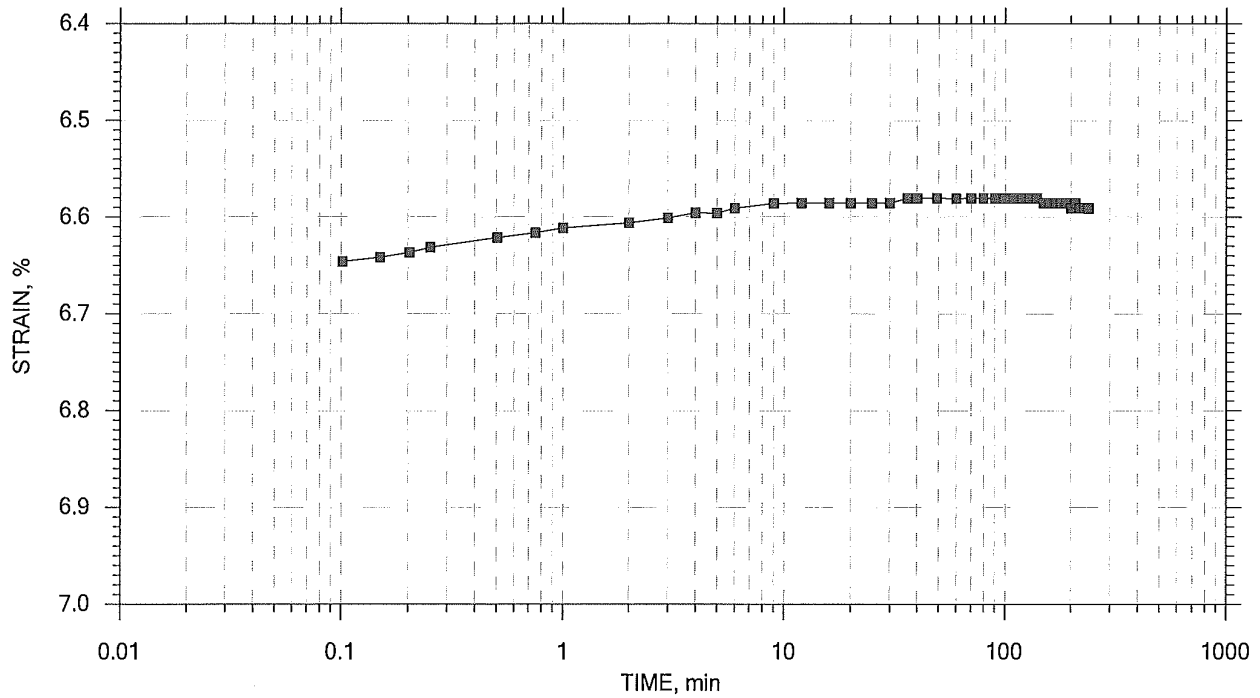
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 7 of 13

Stress: 1 tsf



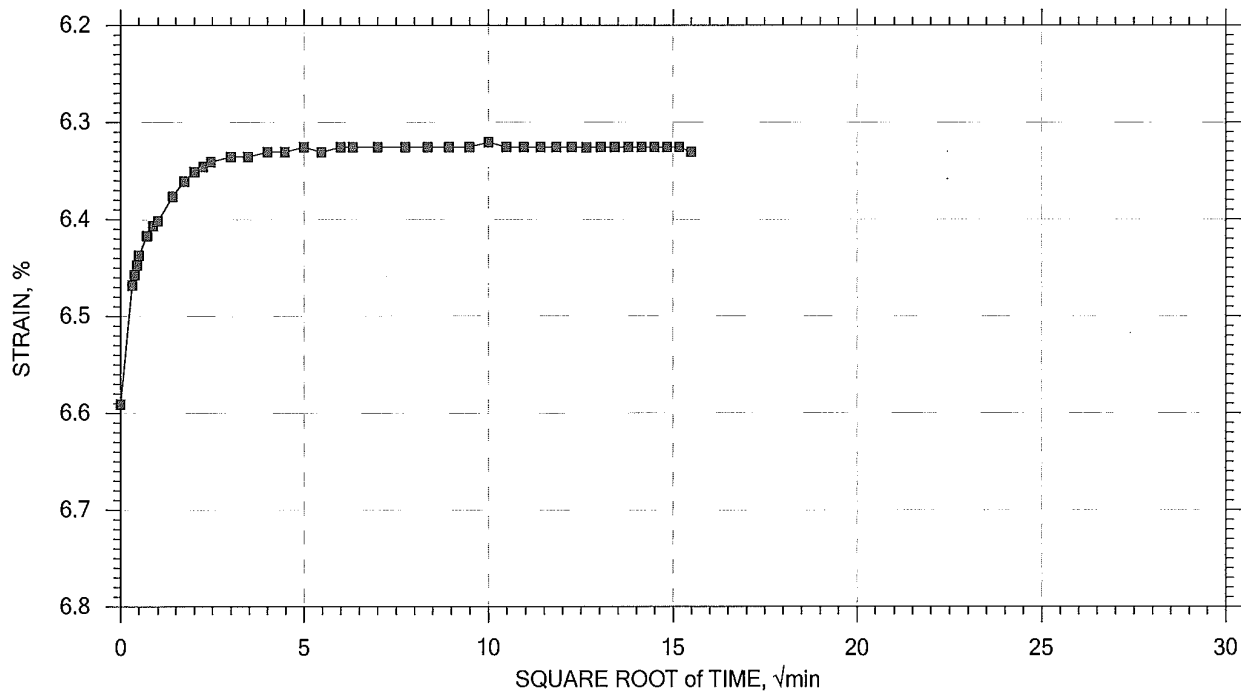
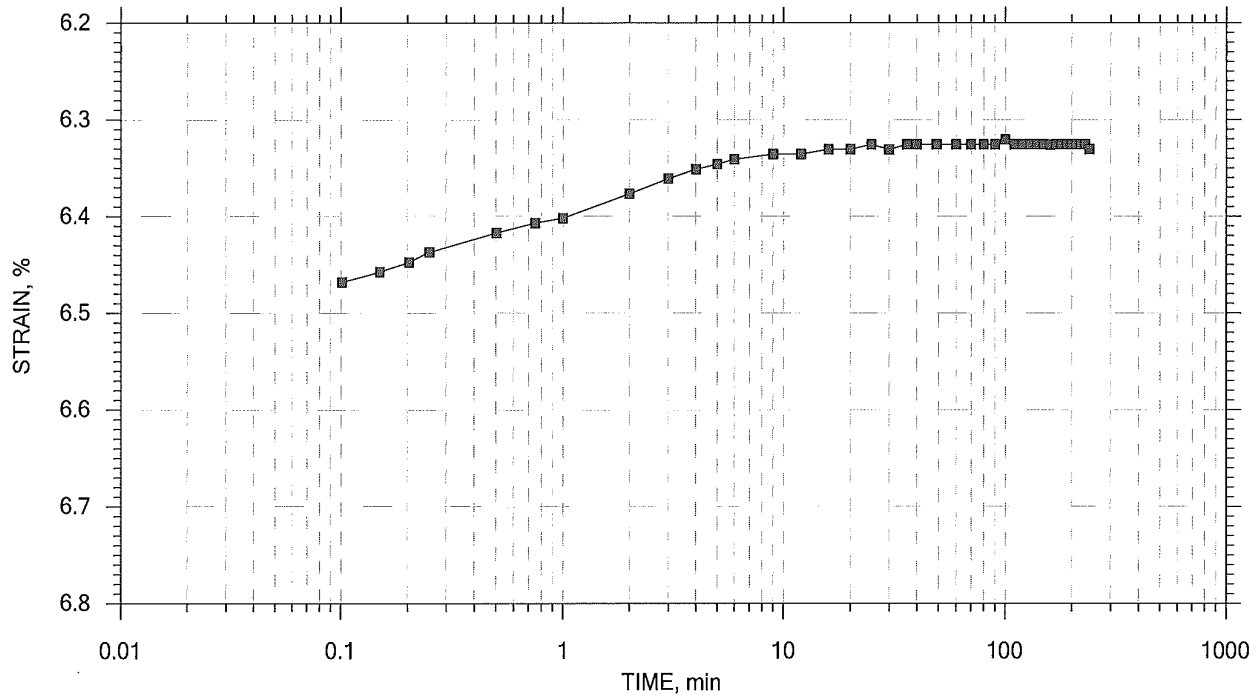
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 8 of 13

Stress: 0.5 tsf



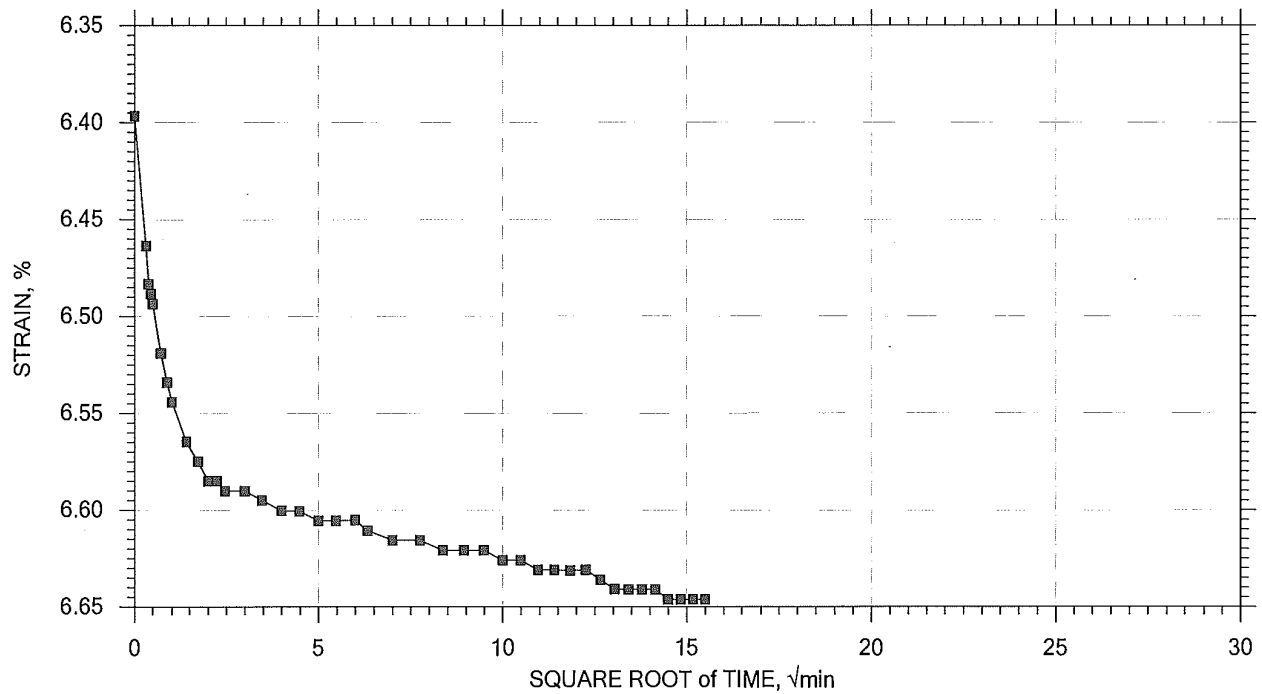
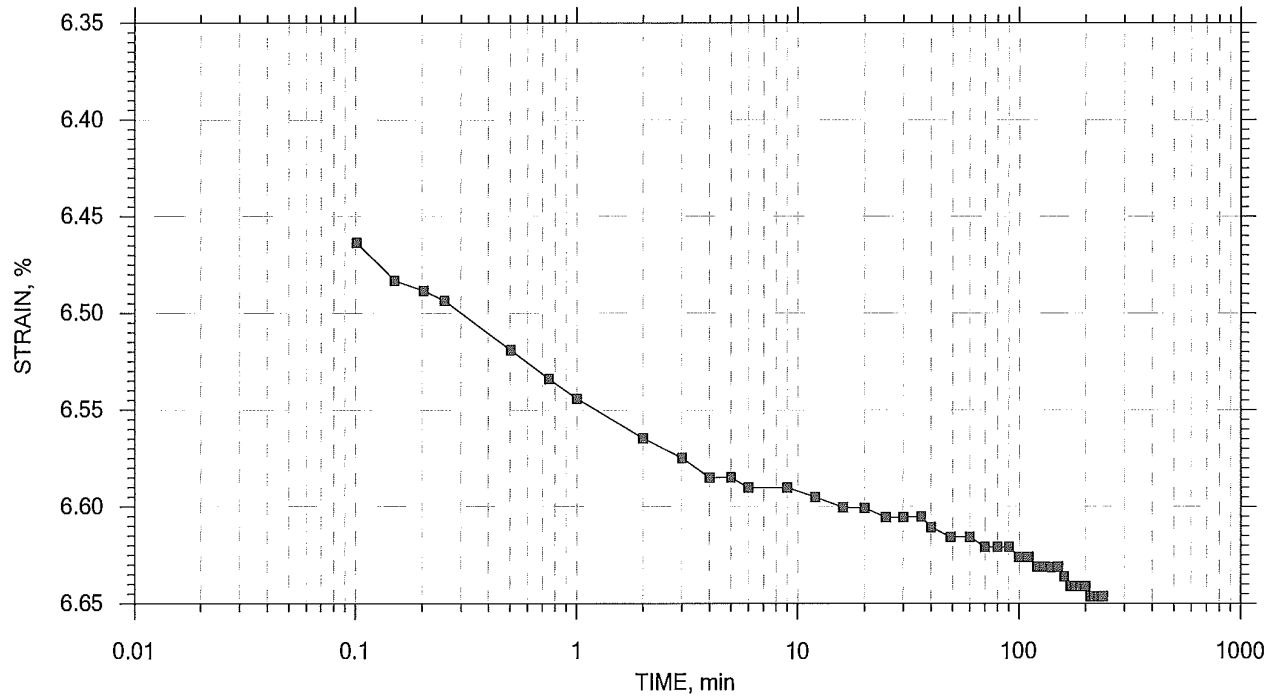
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 9 of 13

Stress: 1 tsf



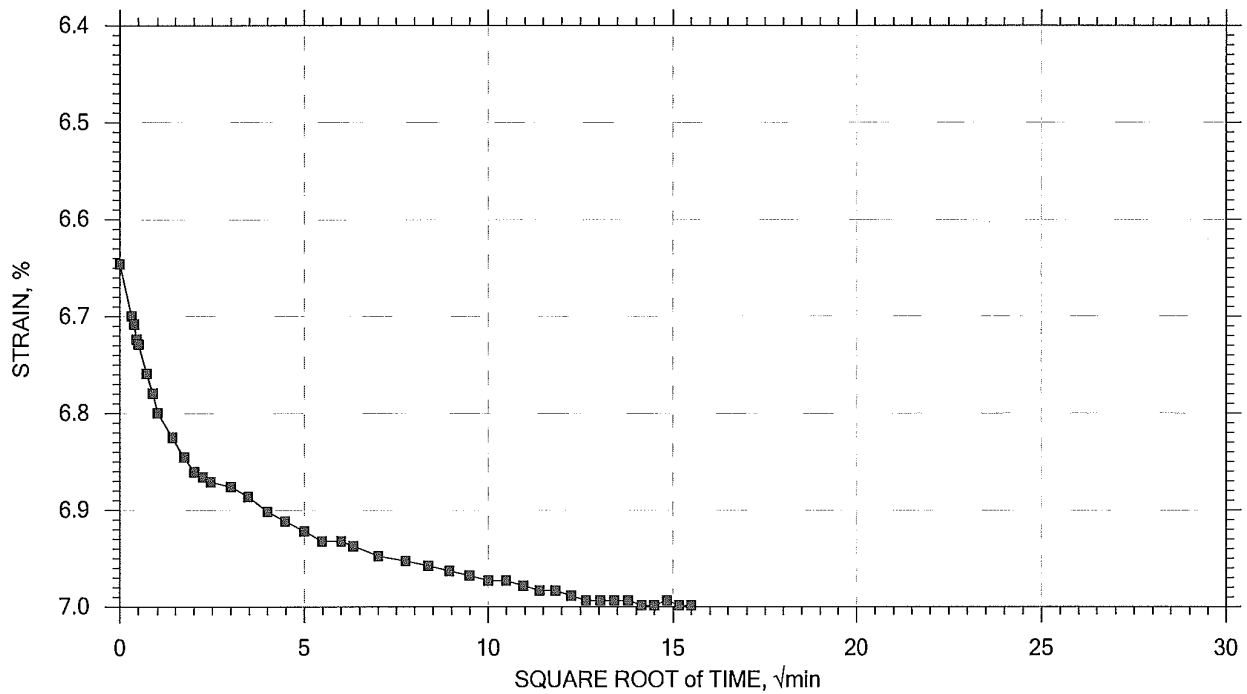
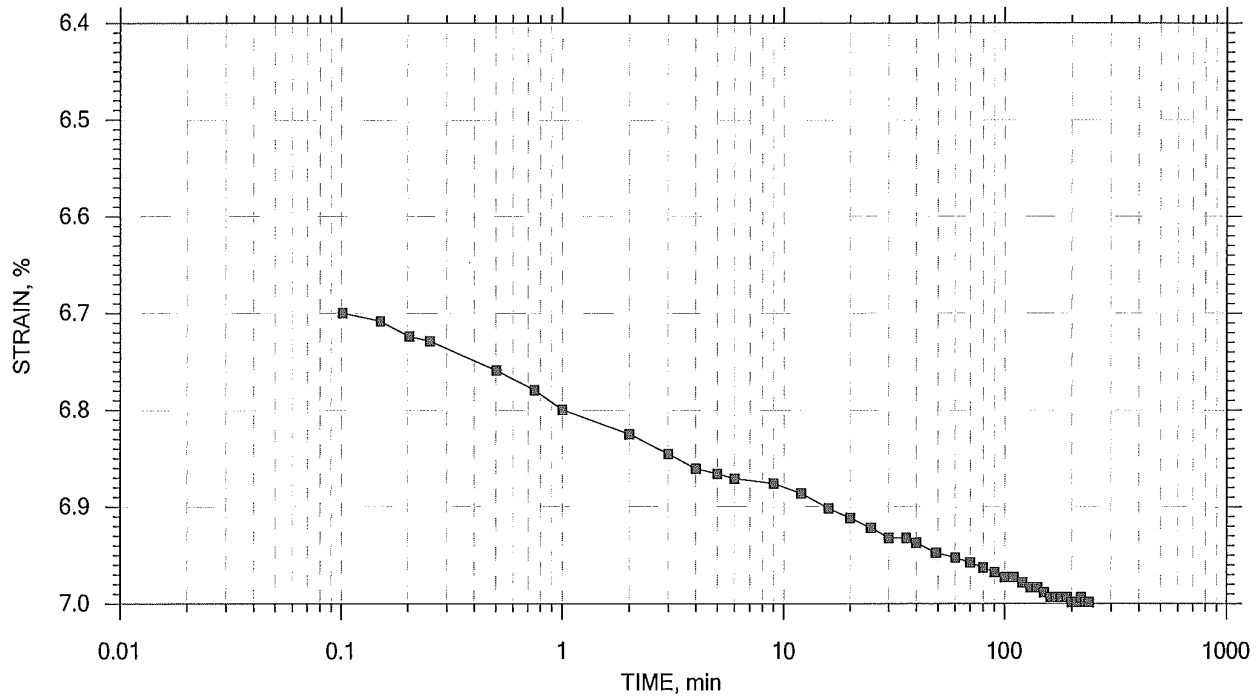
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 10 of 13

Stress: 2 tsf



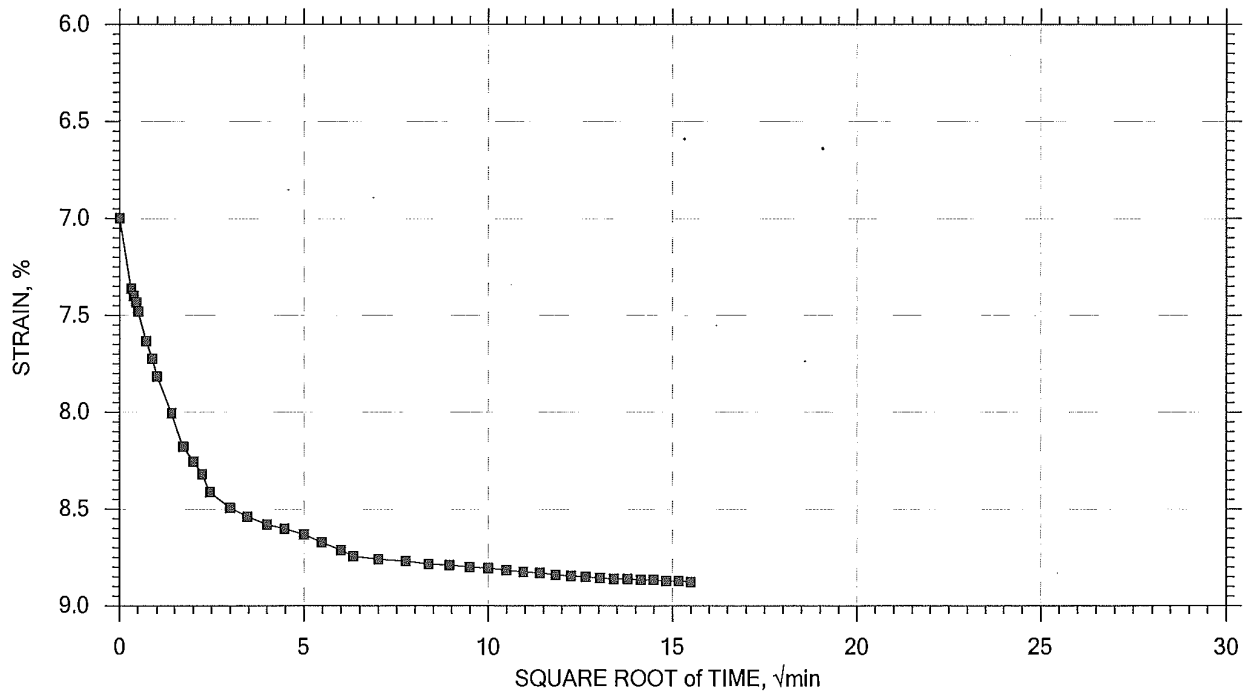
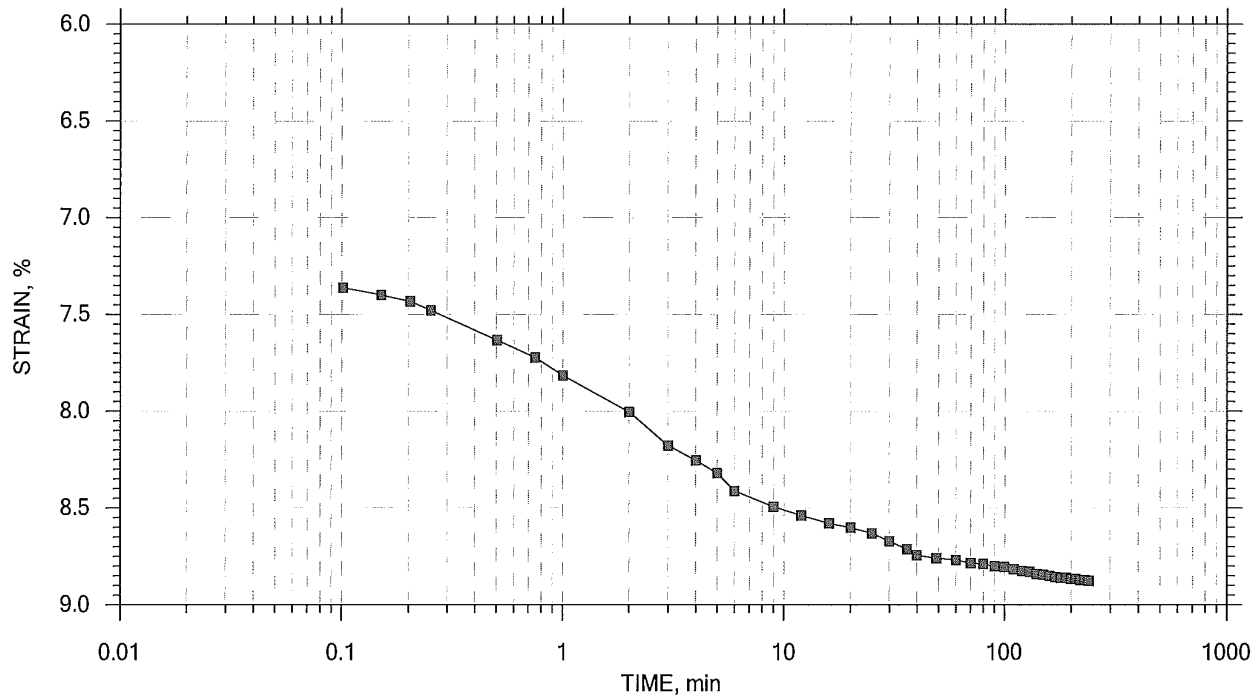
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 11 of 13

Stress: 4 tsf



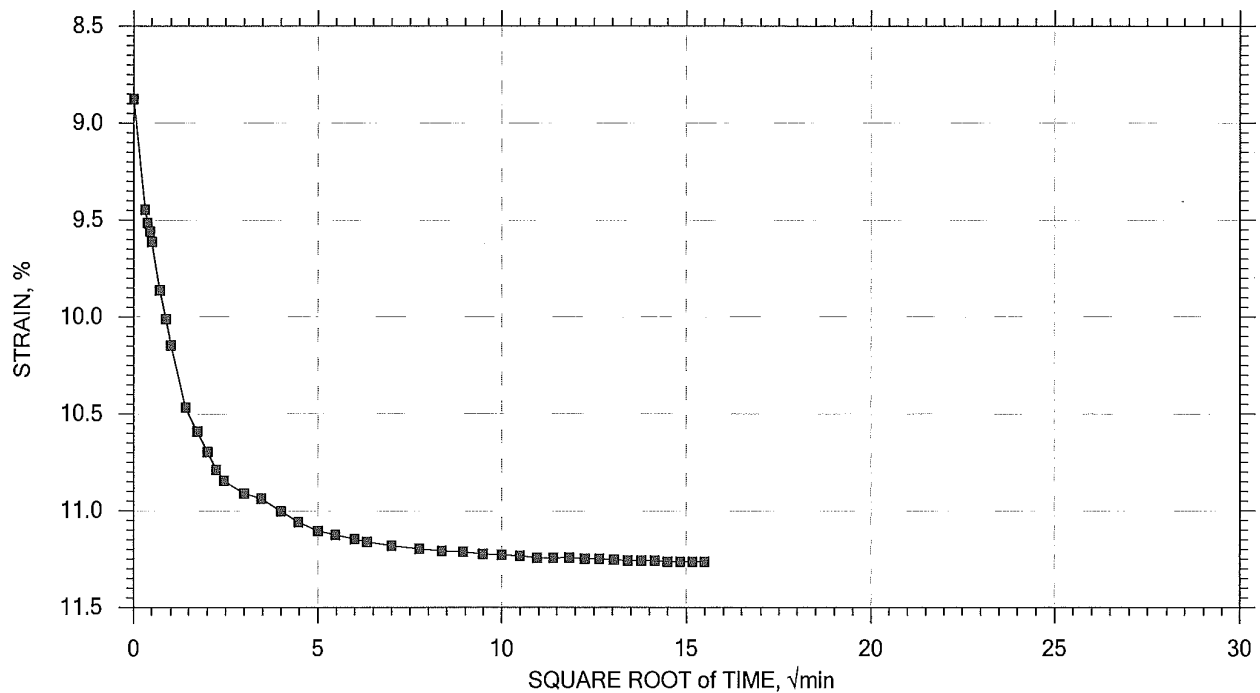
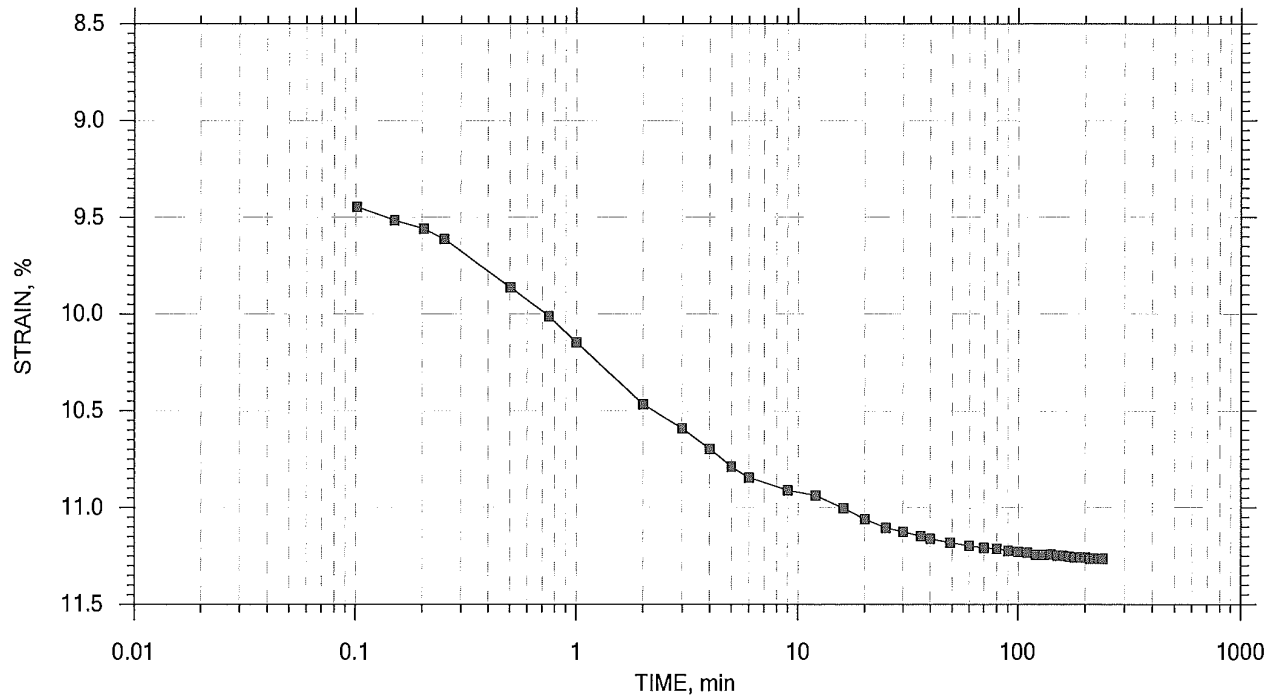
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 12 of 13

Stress: 8 tsf



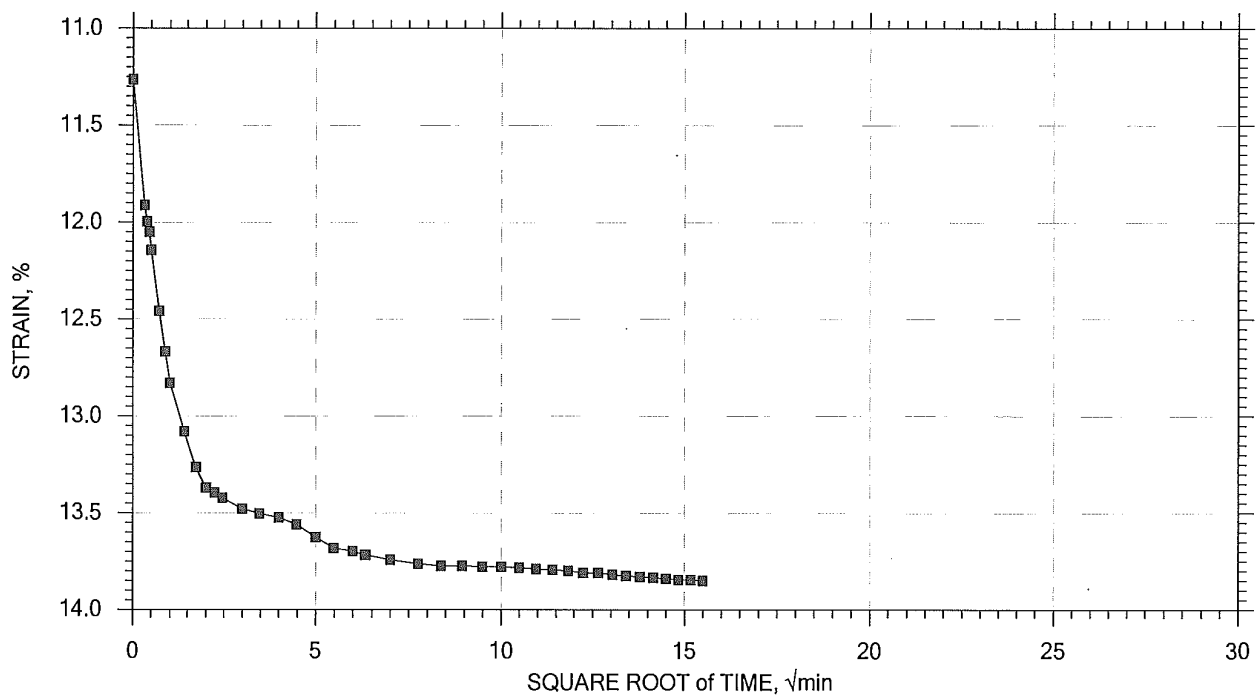
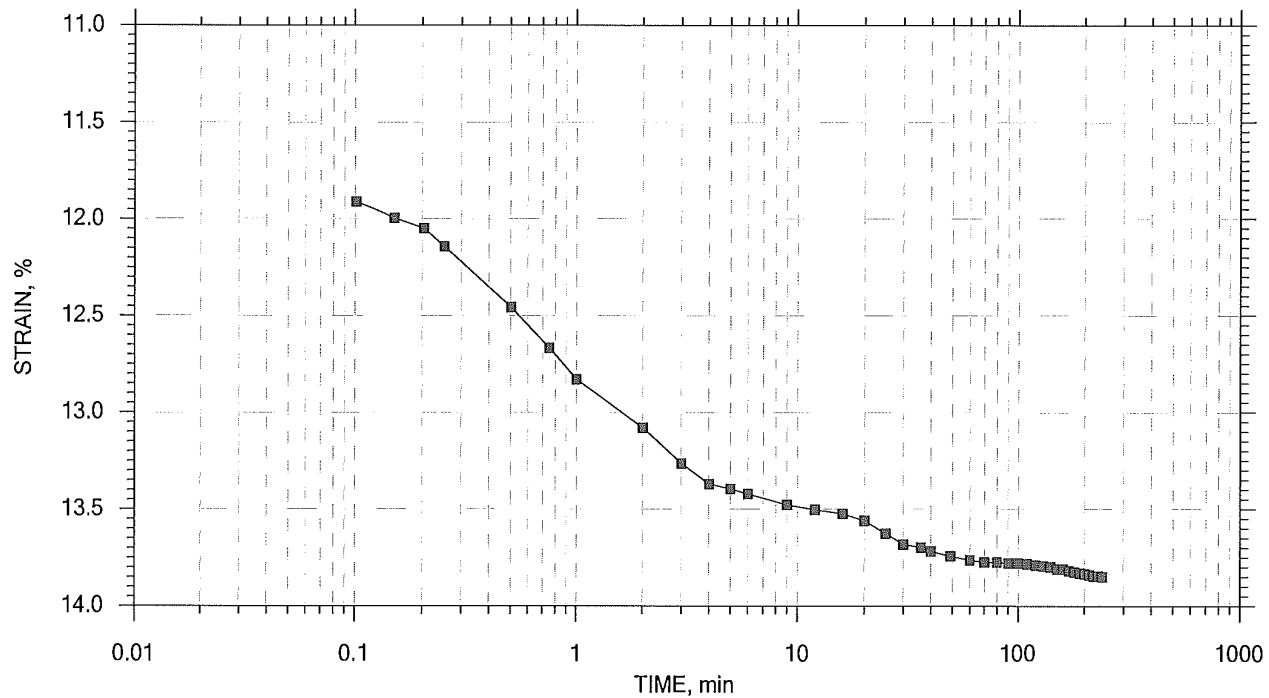
	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		


One-Dimensional Consolidation by ASTM D2435 - Method B

TIME CURVES

Constant Load Step 13 of 13

Stress: 16 tsf

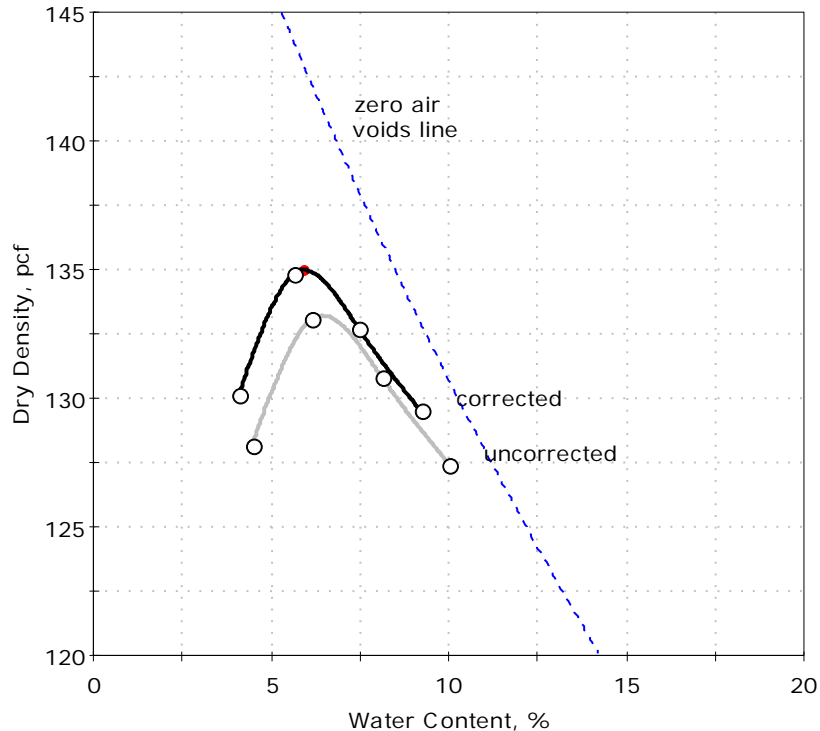


	Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
	Boring No.: B-51	Tested By: md	Checked By: jdt
	Sample No.: OT-2	Test Date: 01/24/14	Test No.: IP-7
	Depth: 64-66 ft	Sample Type: intact	Elevation: ---
	Description: Moist, greenish gray clay with sand		
	Remarks: System T		



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-3	Sample Type:	bucket
Sample ID:	Bulk	Test Date:	12/27/13
Depth :	0-4 ft	Test Id:	285898
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	128.1	133.1	130.8	127.5
Moisture Content, %	4.5	6.1	8.1	10.0

Method : C

Preparation : DRY

As received Moisture : 6 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.65

Maximum Dry Density= 133.0 pcf
Optimum Moisture= 6.5 %

Oversize Correction (8.0% > 3/4 inch Sieve)

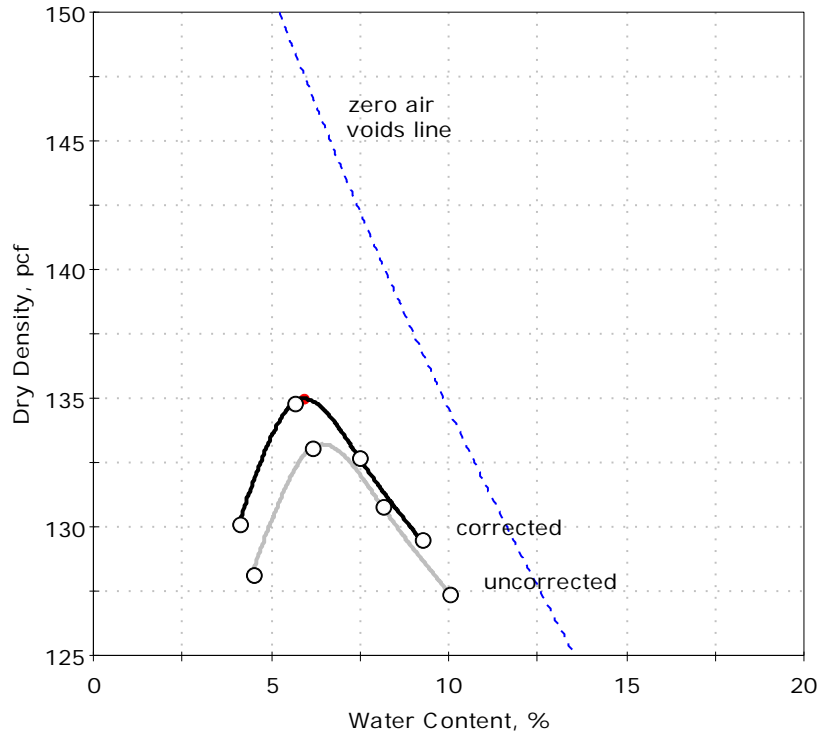
Corrected Maximum Dry Density= 135.0 pcf
Corrected Optimum Moisture= 6.0 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-3	Sample Type:	bucket
Sample ID:	Bulk	Test Date:	12/27/13
Depth :	0-4 ft	Test Id:	285898
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	128.1	133.1	130.8	127.5
Moisture Content, %	4.5	6.1	8.1	10.0

Method : C

Preparation : DRY

As received Moisture : 6 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.75

Maximum Dry Density= 133.0 pcf
Optimum Moisture= 6.5 %

Oversize Correction (8.0% > 3/4 inch Sieve)

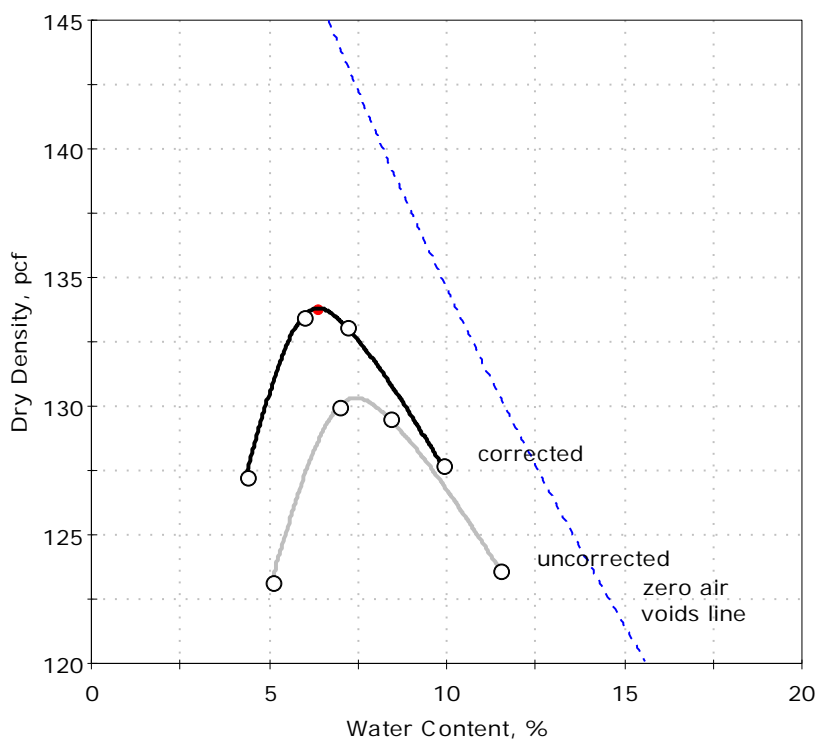
Corrected Maximum Dry Density= 135.0 pcf
Corrected Optimum Moisture= 6.0 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-21	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/14/14
Depth :	0-10 ft	Test Id:	286927
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark gray silty sand with gravel	Checked By:	jdt
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	123.2	130.0	129.5	123.6
Moisture Content, %	5.1	7.0	8.4	11.5

Method : C

Preparation : DRY

As received Moisture : 12 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.75

Maximum Dry Density= 130.5 pcf

Optimum Moisture= 7.5 %

Oversize Correction (14.3% > 3/4 inch Sieve)

Corrected Maximum Dry Density= 134.0 pcf

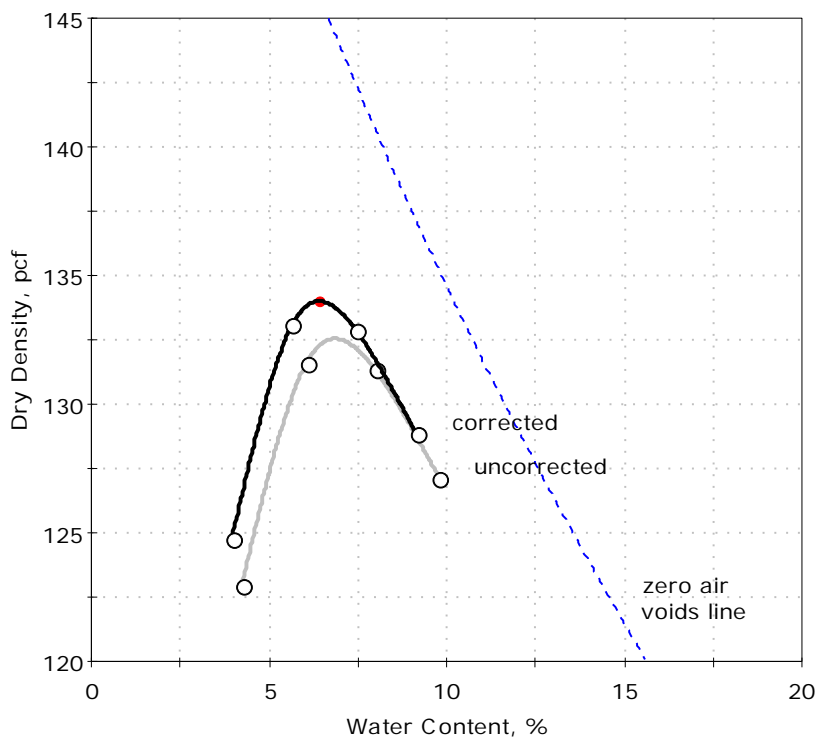
Corrected Optimum Moisture= 6.5 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA	Sample Type:	bucket
Boring ID:	B-26	Tested By:	cwd
Sample ID:	Bulk (B26A / B26)	Test Date:	02/10/14
Depth :	1-4 ft	Checked By:	jdt
		Test Id:	288470
Test Comment:	---		
Sample Description:	Moist, very dark gray sand with silt and gravel		
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	123.0	131.6	131.3	127.1
Moisture Content, %	4.2	6.1	8.0	9.8

Method : C

Preparation : DRY

As received Moisture : 8 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.75

Maximum Dry Density = 132.5 pcf

Optimum Moisture = 7.0 %

Oversize Correction (6.5% > 3/4 inch Sieve)

Corrected Maximum Dry Density = 134.0 pcf

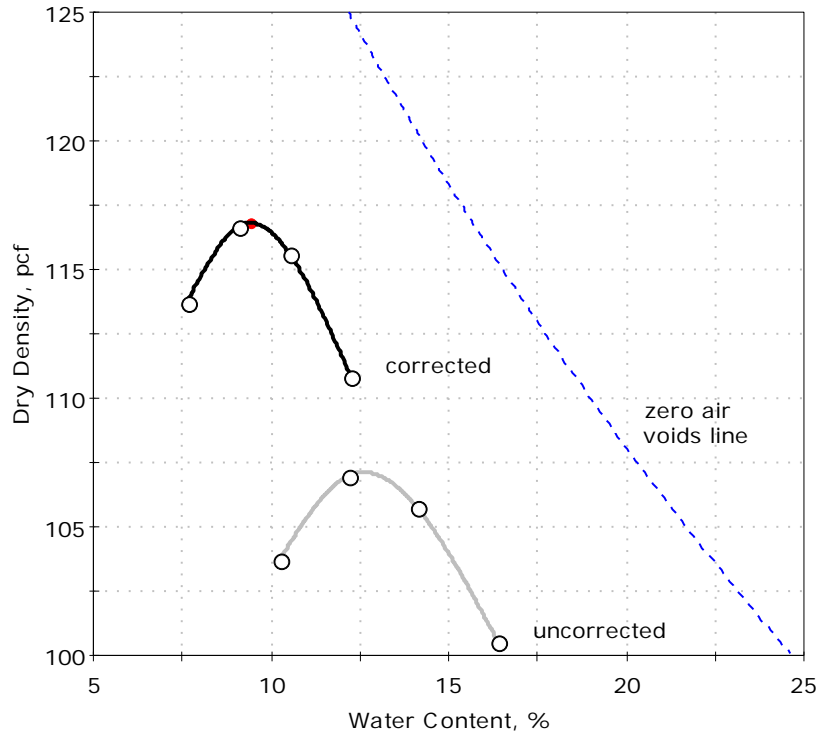
Corrected Optimum Moisture = 6.5 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA	Sample Type:	bucket
Boring ID:	B-30	Tested By:	cwd
Sample ID:	Bulk (B31 / B32)	Test Date:	02/10/14
Depth :	1-3 ft	Checked By:	jdt
		Test Id:	288471
Test Comment:	---		
Sample Description:	Moist, black silty gravel with sand		
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	103.7	107.0	105.8	100.5
Moisture Content, %	10.2	12.2	14.1	16.4

Method : C

Preparation : DRY

As received Moisture : 21 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.65

Maximum Dry Density= 107.0 pcf
Optimum Moisture= 12.5 %

Oversize Correction (25.3% > 3/4 inch Sieve)

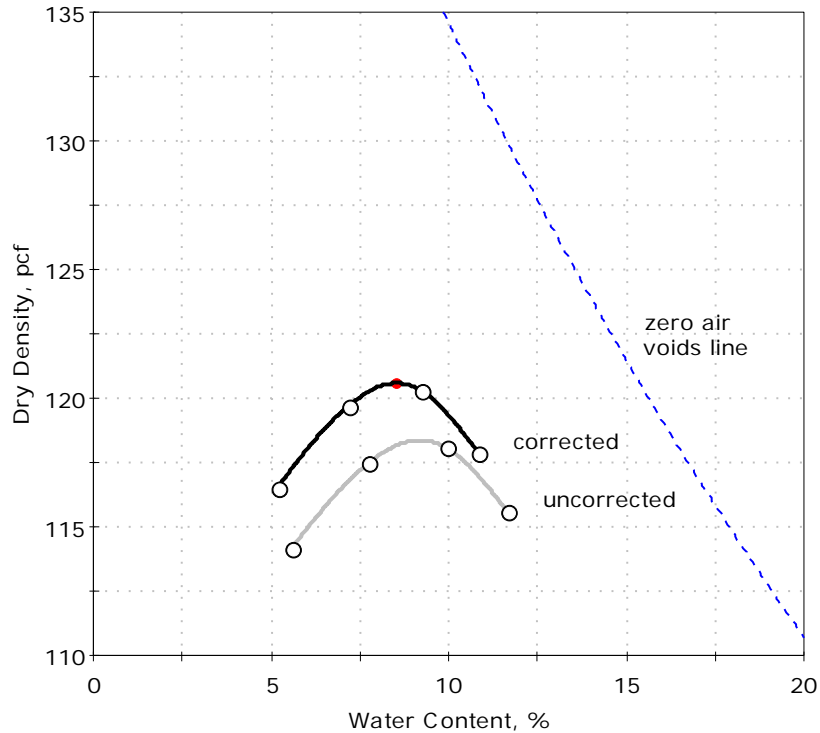
Corrected Maximum Dry Density= 117.0 pcf
Corrected Optimum Moisture= 9.5 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-37	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/13/14
Depth :	1-5 ft	Test Id:	286926
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, dark grayish brown sand with silt and gravel	Checked By:	jdt
Sample Comment:	----		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	114.2	117.5	118.1	115.6
Moisture Content, %	5.6	7.8	9.9	11.7

Method : C

Preparation : DRY

As received Moisture : 18 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.75

Maximum Dry Density= 118.5 pcf

Optimum Moisture= 9.0 %

Oversize Correction (7.2% > 3/4 inch Sieve)

Corrected Maximum Dry Density= 120.5 pcf

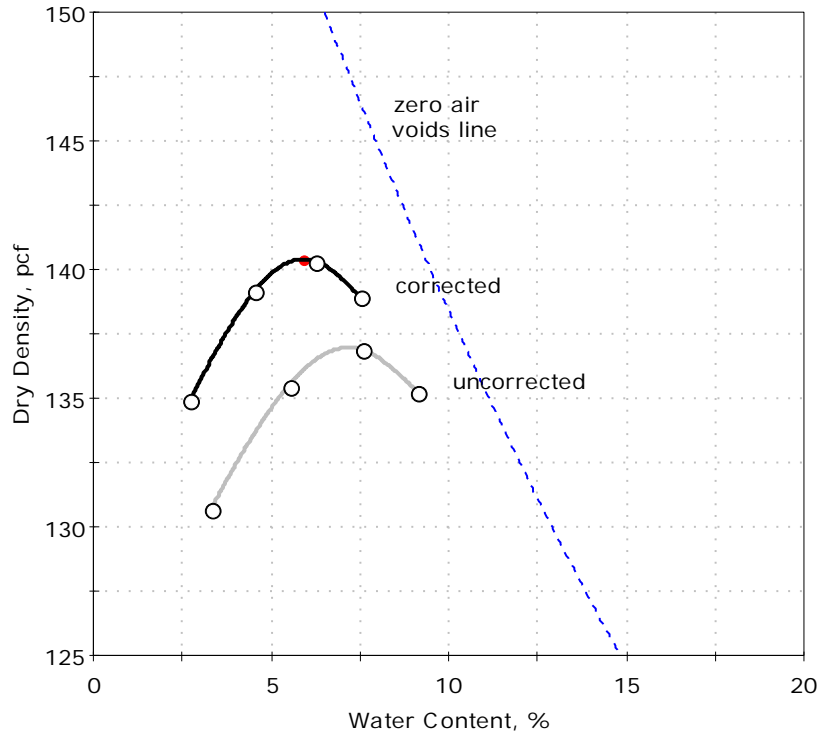
Corrected Optimum Moisture= 8.5 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-39	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/14/14
Depth :	1-5 ft	Test Id:	286925
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark grayish brown gravel with silt and sand		
Sample Comment:	---	Checked By:	jdt

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	130.7	135.5	136.9	135.3
Moisture Content, %	3.3	5.5	7.6	9.1

Method : C

Preparation : DRY

As received Moisture : 8 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.85

Maximum Dry Density = 137.0 pcf
Optimum Moisture = 7.0 %

Oversize Correction (17.6% > 3/4 inch Sieve)

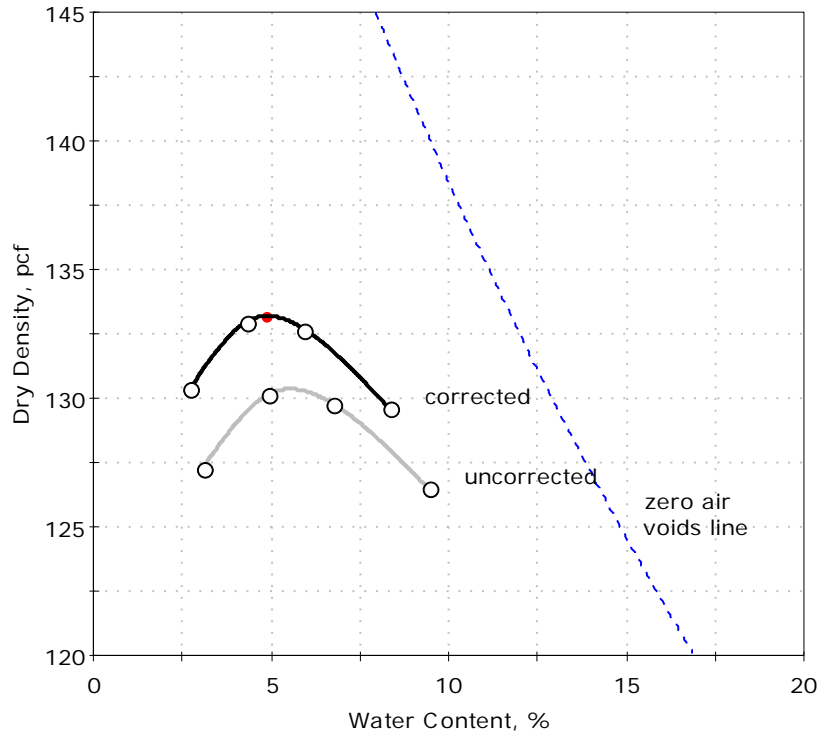
Corrected Maximum Dry Density = 140.5 pcf
Corrected Optimum Moisture = 6.0 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-41	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/14/14
Depth :	1-5 ft	Test Id:	286924
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	127.3	130.1	129.8	126.5
Moisture Content, %	3.1	4.9	6.7	9.4

Method : C

Preparation : DRY

As received Moisture : 6 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.85

Maximum Dry Density= 130.5 pcf
Optimum Moisture= 5.5 %

Oversize Correction (11.8% > 3/4 inch Sieve)

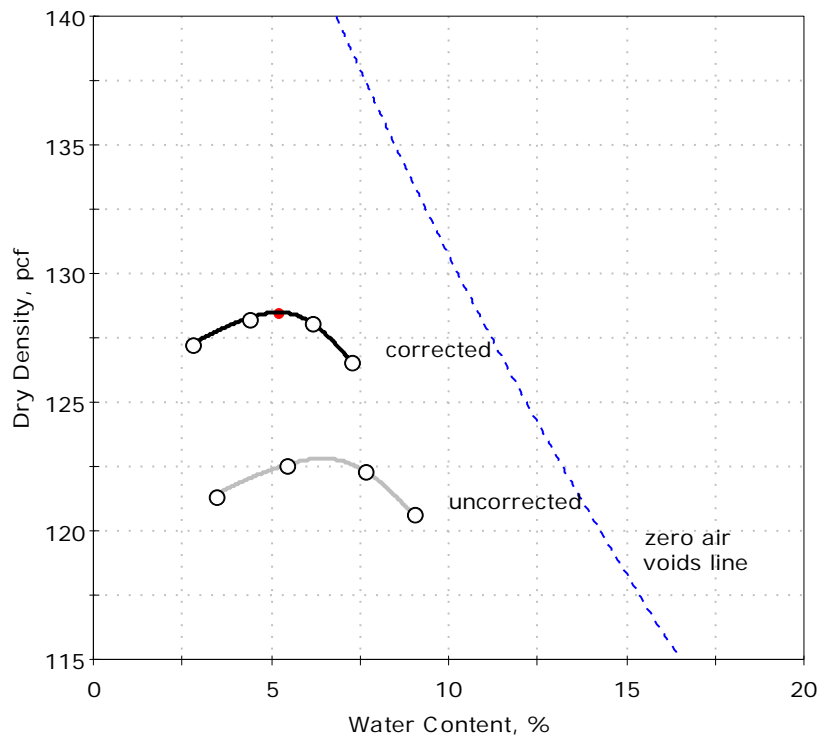
Corrected Maximum Dry Density= 133.0 pcf
Corrected Optimum Moisture= 5.0 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-48	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/15/14
Depth :	1-5 ft	Test Id:	286923
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark gray gravel with silt and sand	Checked By:	jdt
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	121.4	122.6	122.3	120.7
Moisture Content, %	3.4	5.4	7.6	9.0

Method : C

Preparation : DRY

As received Moisture : 10 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.65

Maximum Dry Density= 123.0 pcf
Optimum Moisture= 6.5 %

Oversize Correction (19.4% > 3/4 inch Sieve)

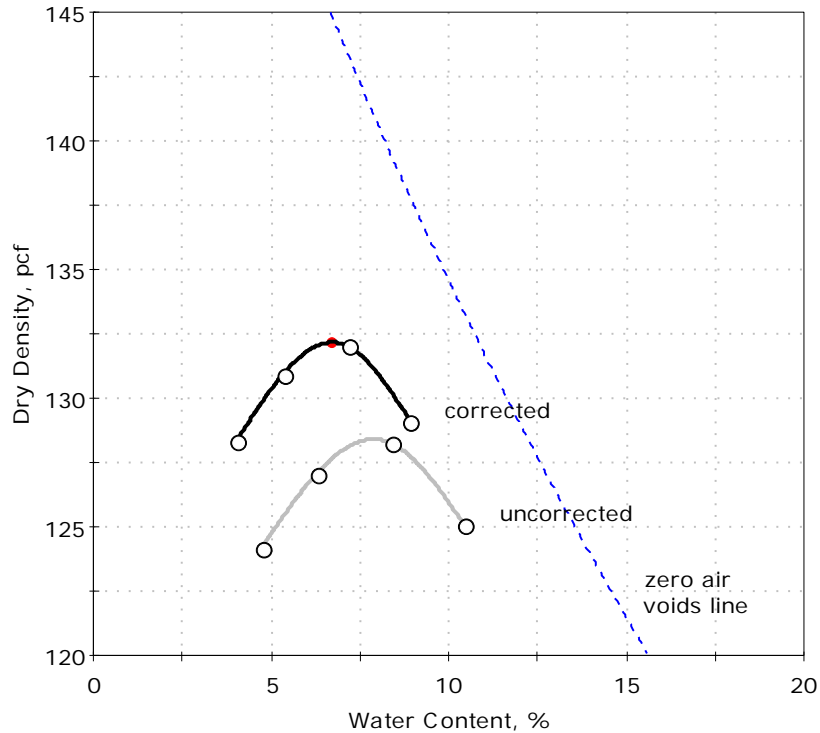
Corrected Maximum Dry Density= 128.5 pcf
Corrected Optimum Moisture= 5.0 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	B-57	Sample Type:	bag
Sample ID:	Bulk	Test Date:	01/15/14
Depth :	1-5 ft	Test Id:	286922
Test Comment:	---	Tested By:	cwd
Sample Description:	Moist, very dark gray sand with silt and gravel	Checked By:	jdt
Sample Comment:	---		

Compaction Report - ASTM D1557



Data Points	Point 1	Point 2	Point 3	Point 4
Dry density, pcf	124.2	127.0	128.2	125.0
Moisture Content, %	4.7	6.3	8.4	10.5

Method : C

Preparation : DRY

As received Moisture : 12 %

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.75

Maximum Dry Density= 128.5 pcf

Optimum Moisture= 8.0 %

Oversize Correction (14.7% > 3/4 inch Sieve)

Corrected Maximum Dry Density= 132.0 pcf

Corrected Optimum Moisture= 6.5 %

Assumed Average Bulk Specific Gravity = 2.55



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA		
Project No:	GTX-301232		
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	12/26/13
Depth :	---	Test Id:	285460
		Tested By:	jek
		Checked By:	jdt

Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content, %	Ash Content, %	Organic Matter, %
B-2	SPT-5	20-22 ft	Moist, dark olive gray clayey sand	37	97.8	2.2
B-3	SPT-4	15-17 ft	Moist, dark olive gray clay	45	96.8	3.2

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;
dried to a constant mass at temperature of 105° C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440° C

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Client:	AECOM	Project No:	GTX-301232
Project:	Silverline		
Location:	Chelsea, MA		
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	01/27/14
Depth :	---	Test Id:	287495
		Tested By:	jek
		Checked By:	jdt

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
B-36	SPT-3	9-11 ft	Moist, very dark gray clay	20.1
B-36	SPT-5	19-21 ft	Moist, olive brown clay	24.1
B-36	SPT-7	29-31 ft	Moist, grayish brown sand with silt	21.8
B-36	SPT-9	39-41 ft	Moist, light brownish gray clay	30.6
B-50	SPT-1	9-11 ft	Wet, dark olive brown clay	108.0
B-50	SPT-4	29-31 ft	Moist, gray clay	41.1
B-50	SPT-6	39-41 ft	Moist, light brownish gray clay	39.1
B-50	SPT-9	54-56 ft	Moist, olive clay	25.9
B-50	SPT-2	14-16 ft	Moist, light brownish gray clay	33.8

Notes: Temperature of Drying : 110° Celsius

printed 1/31/2014 8:02:14 AM



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA	Project No:	GTX-301232
Boring ID:	B-38	Sample Type:	jar
Sample ID:	SPT-2	Test Date:	01/15/14
Depth :	10-12 ft	Test Id:	286938
Test Comment:	---	Tested By:	jek
Sample Description:	Moist, dark brown silty sand with organics		
Sample Comment:	---	Checked By:	jdt

Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content, %	Ash Content, %	Organic Matter, %
B-38	SPT-2	10-12 ft	Moist, dark brown silty sand with organics	193	67.4	32.6

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;
dried to a constant mass at temperature of 105° C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440° C

printed 1/23/2014 9:50:40 AM



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA	Project No:	GTX-301232
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	12/27/13
Depth :	---	Test Id:	285459
		Tested By:	jek
		Checked By:	jdt

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
B-42	SPT-5	19-21 ft	Moist, olive gray clay	33.8
B-42	SPT-6	24-26 ft	Moist, olive gray clay	36.5
B-42	SPT-9	39-41 ft	Moist, dark olive gray clay	37.6
B-42	---	49-51 ft	Moist, dark olive gray clay	38.0
B-42	---	59-61 ft	Moist, olive gray clay	33.6

Notes: Temperature of Drying : 110° Celsius

printed 12/27/2013 11:19:20 AM



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA	Project No:	GTX-301232
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	12/27/13
Depth :	---	Test Id:	285625
		Tested By:	jek
		Checked By:	jdt

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
B-47	SPT-4	14-16 ft	Moist, olive clay	25.7
B-47	SPT-5	19-21 ft	Moist, olive clay	33.5

Notes: Temperature of Drying : 110° Celsius

printed 1/8/2014 10:04:36 AM



Client:	AECOM		
Project:	Silverline		
Location:	Chelsea, MA	Project No:	GTX-301232
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	01/27/14
Depth :	---	Test Id:	287527
		Tested By:	jek
		Checked By:	jdt

Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content, %	Ash Content, %	Organic Matter, %
B-44	SPT-1	6-8 ft	Moist, yellowish brown silty, clayey sand with gravel	44	95.3	4.7
B-52	SPT-1	6-8 ft	Wet, very dark brown sandy silt	65	92.2	7.8
B-59	SPT-2	10-12 ft	Moist, very dark brown sandy organic silt	167	77.1	22.9

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass; dried to a constant mass at temperature of 105° C
 Ash content and organic matter determined by Method C; dried to constant mass at temperature 440° C

printed 1/31/2014 10:07:45 AM



Client:	AECOM
Project Name:	Silverline
Project Location:	Chelsea, MA
GTX #:	301232
Date:	12/20/13
Tested by:	md
Checked by:	jdt

Laboratory Vane Shear by ASTM D 4648

Boring ID	Sample ID	Depth, ft	Visual Description	Peak		Residual	
				Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf	Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf
B-47	---	24-26	Moist, greenish gray clay	22.6	0.24	0.0	0.00
				23.6	0.25	0.0	0.00
				24.9	0.26	0.0	0.00
			Average	23.7	0.25	0.0	0.00

Boring ID	Sample ID	Depth, ft	Visual Description	Peak		Residual	
				Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf	Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf
B-47	0	34-36	Moist, greenish gray clay	19.0	0.20	0.0	0.00
				16.8	0.18	0.0	0.00
				20.3	0.21	0.0	0.00
			Average	18.7	0.20	0.0	0.00

Boring ID	Sample ID	Depth, ft	Visual Description	Peak		Residual	
				Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf	Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf
B-47	---	44-46	Moist, greenish gray clay	20.4	0.21	0.0	0.00
				20.4	0.21	0.0	0.00
				13.9	0.14	0.0	0.00
			Average	18.2	0.19	0.0	0.00



Client:	AECOM
Project Name:	Silverline
Project Location:	Chelsea, MA
GTX #:	301232
Date:	12/20/13
Tested by:	md
Checked by:	jdt

Laboratory Vane Shear by ASTM D 4648

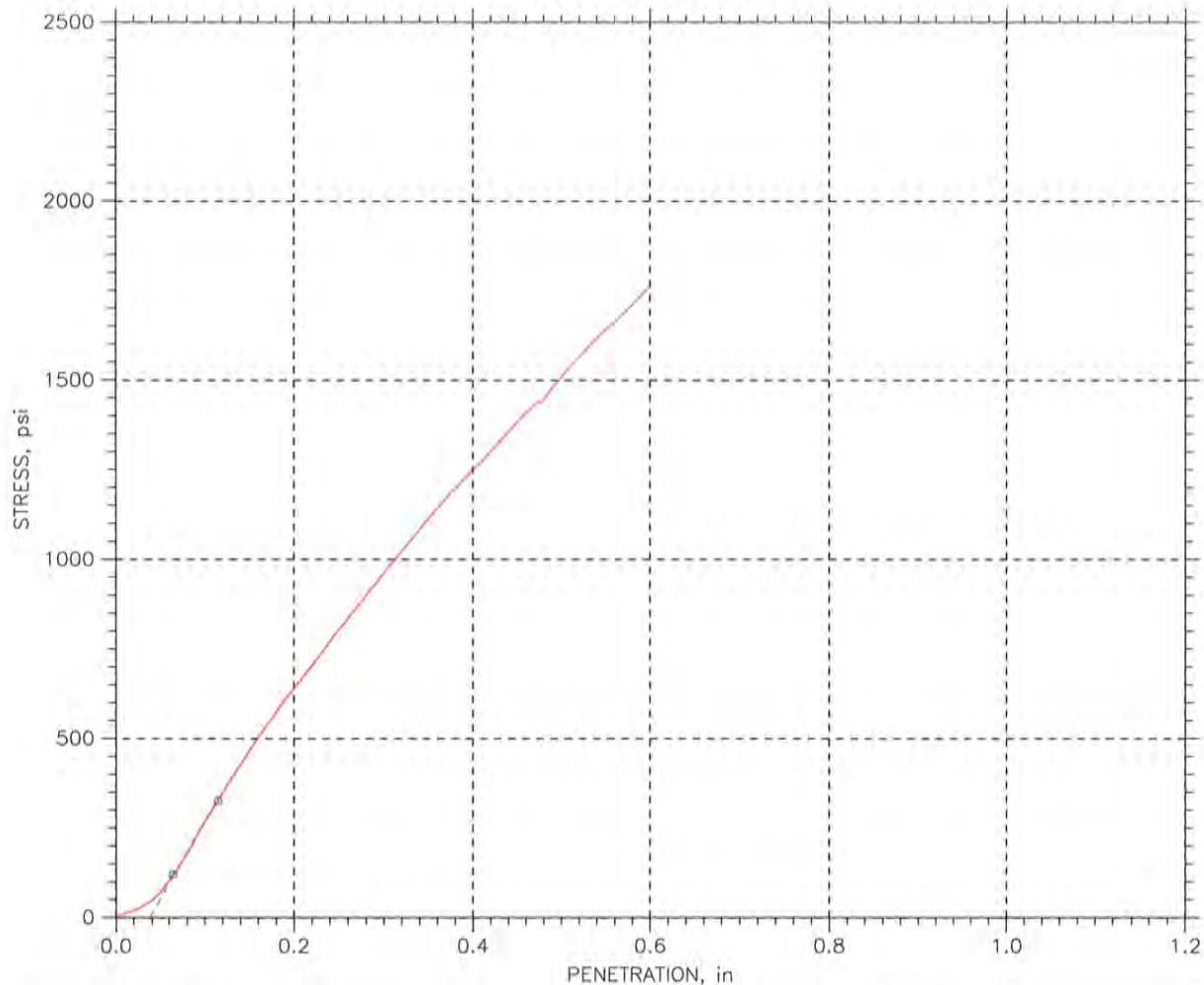
Boring ID	Sample ID	Depth, ft	Visual Description	Peak		Residual	
				Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf	Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf
B-47	---	59-61	Moist, greenish gray clay	21.9	0.23	0.0	0.00
				19.0	0.20	0.0	0.00
				10.9	0.11	0.0	0.00
			Average	17.3	0.18	0.0	0.00

Boring ID	Sample ID	Depth, ft	Visual Description	Peak		Residual	
				Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf	Vane Shear Strength, kN/m ²	Vane Shear Strength, tsf
B-47	---	79-81	Moist, greenish gray clay with sand	19.7	0.21	0.0	0.00
				21.9	0.23	0.0	0.00
				13.1	0.14	0.0	0.00
			Average	18.2	0.19	0.0	0.00

Comments: The remolded (residual) shear strength was determined immediately after ten rapid revolutions of the vane.



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

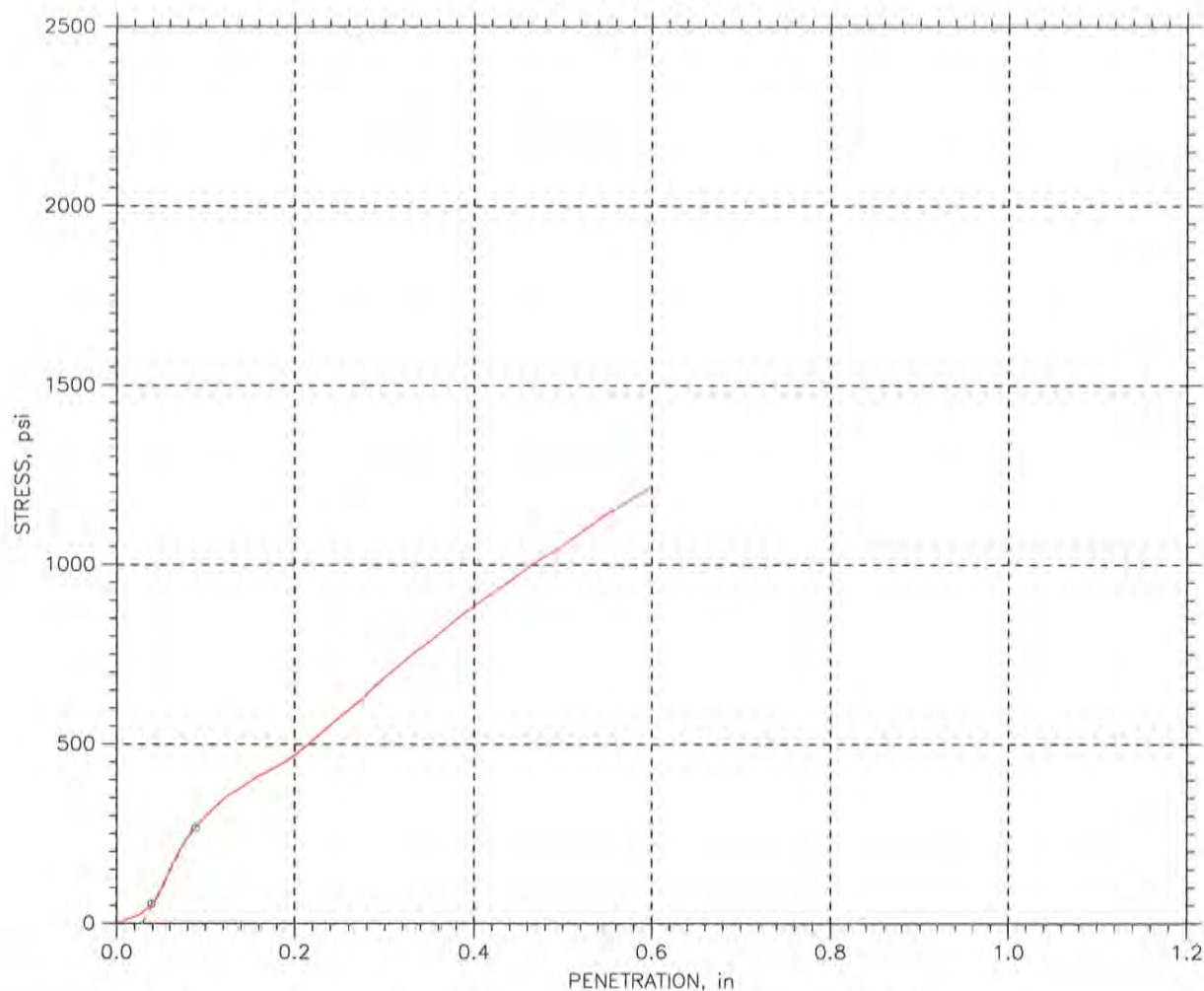


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 42	at 0.3 in: 57	at 0.5 in: 62	
Sample Volume: 0.07494 ft^3	at 0.2 in: 51	at 0.4 in: 59		
Sample Mass: 4621.2 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.02 %	Tare ID	TARE13753	TARE12720	TARE13759
Surcharge: 4540 gm	Tare Mass, gm	8.4	8.12	8.28
Void Ratio: 0.29	Mass Tare + Wet Soil, gm	271.83	394.25	466.12
Wet Unit Weight: 135.95 pcf	Mass Tare + Dry Soil, gm	256.11	367.97	433.5
Dry Unit Weight: 127.84 pcf	Water Content, %	6.35	7.30	7.67

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-3	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 12/23/2013	Depth: 0-4 ft
Test No.: CBR-1	Sample Type: remolded	Elevation: ---
Description: Moist, very dark gray sand with silt and gravel		
Remarks: Target Compaction: 95% of maximum dry density (135.0 pcf) at optimum moisture content (6.0%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883



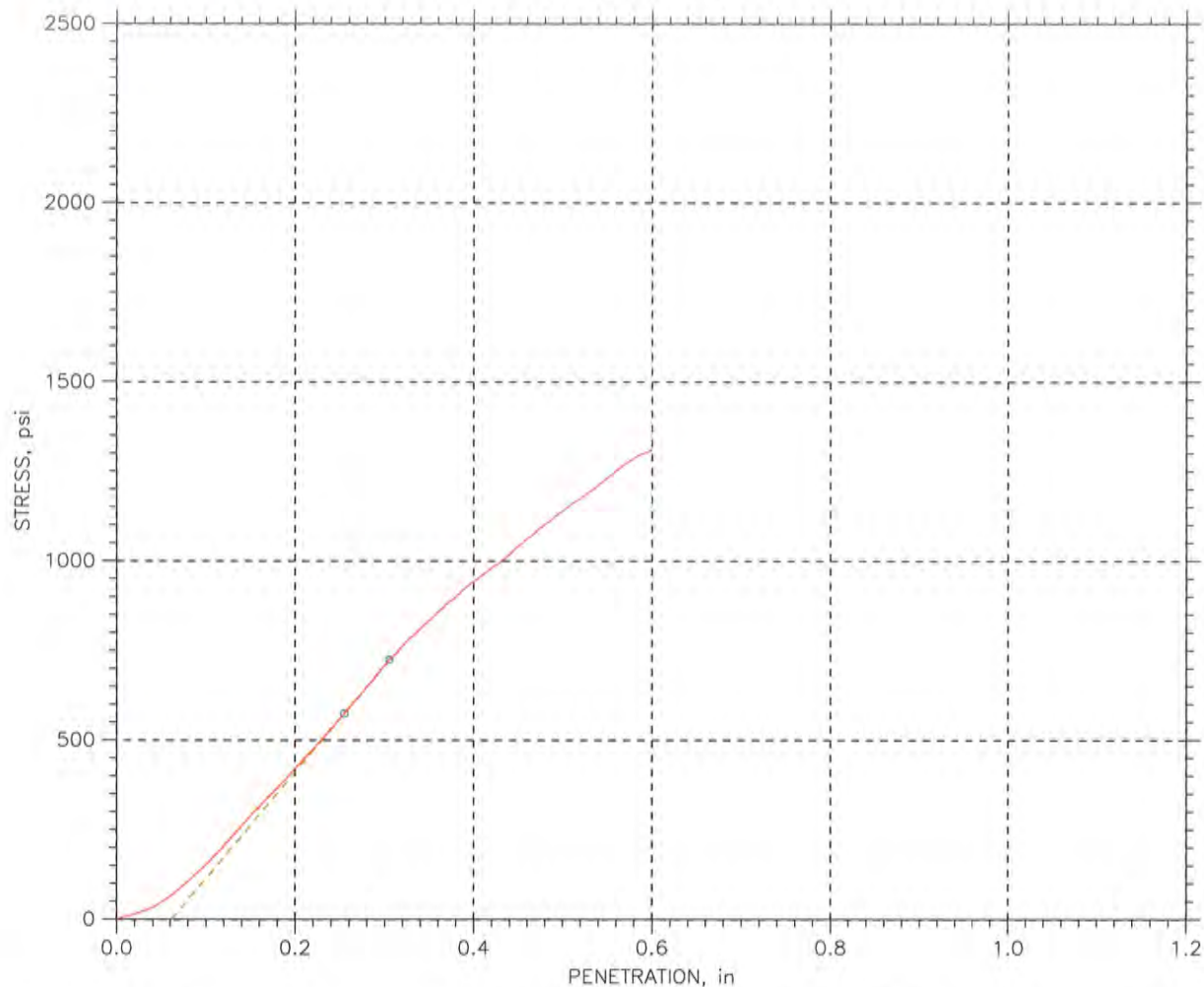
Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 36	at 0.3 in: 39	at 0.5 in: 42	
Sample Volume: 0.07494 ft^3	at 0.2 in: 35	at 0.4 in: 41		
Sample Mass: 4609.2 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.04 %	Tare ID	TARE14072	TARE13919	TARE13310
Surcharge: 4540 gm	Tare Mass, gm	8.28	8.34	8.24
Void Ratio: 0.30	Mass Tare + Wet Soil, gm	386.88	395.65	404.04
Wet Unit Weight: 135.6 pcf	Mass Tare + Dry Soil, gm	364.25	365.86	371.26
Dry Unit Weight: 127.49 pcf	Water Content, %	6.36	8.33	9.03

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-21	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 1/20/2014	Depth: 0-10 ft
Test No.: CBR-3	Sample Type: remolded	Elevation: ---
Description: Moist, very dark gray silty sand with gravel		
Remarks: Target Compaction: 95% of maximum dry density (134.0 pcf) at optimum moisture content (6.5%).		

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CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

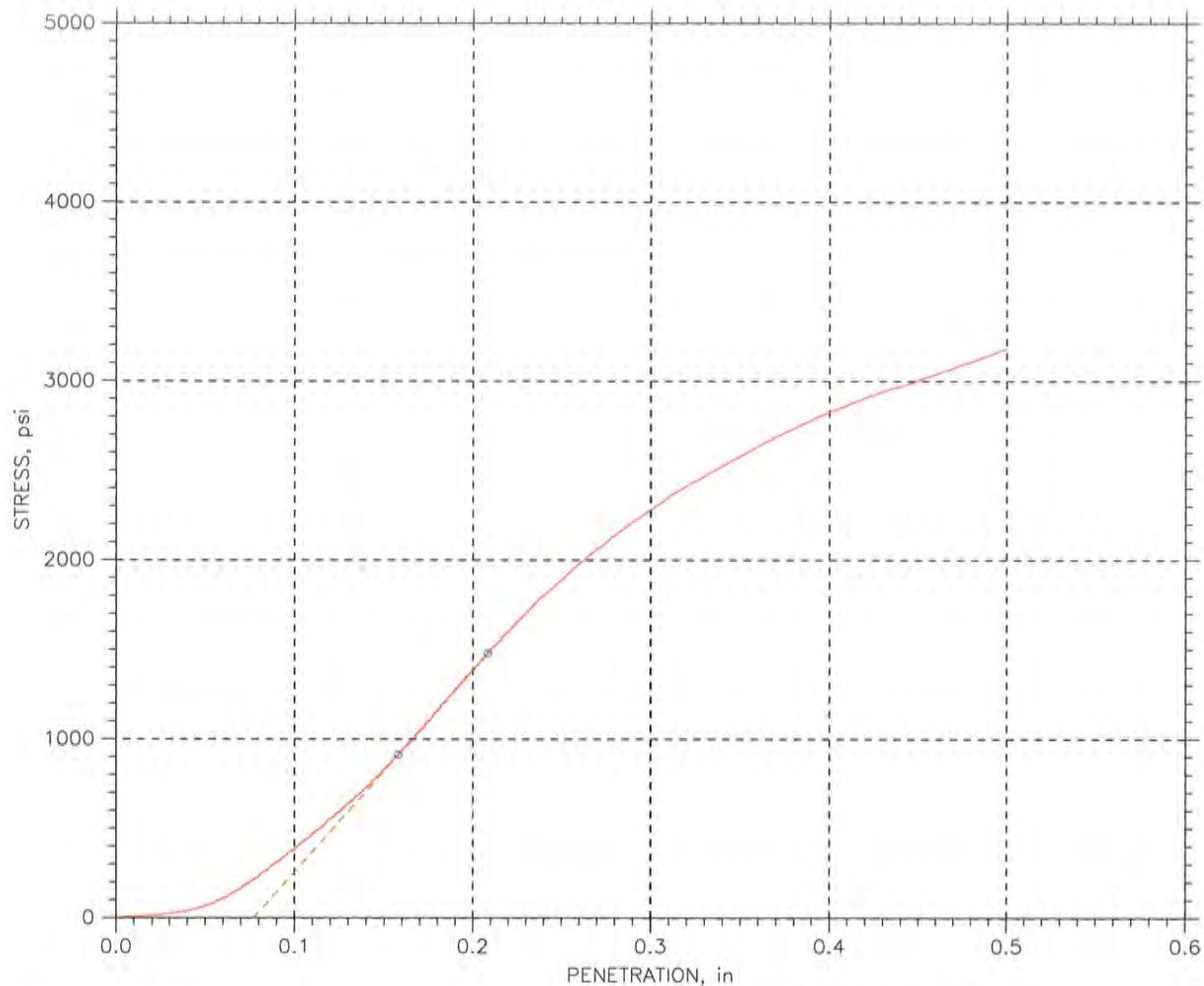


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 32	at 0.3 in: 45	at 0.5 in: 48	
Sample Volume: 0.07494 ft^3	at 0.2 in: 40	at 0.4 in: 46		
Sample Mass: 4610.6 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.02 %	Tare ID	TARE13663	TARE13667	TARE13669
Surcharge: 4540 gm	Tare Mass, gm	8.23	8.22	8.23
Void Ratio: 0.30	Mass Tare + Wet Soil, gm	226.97	234.96	512.4
Wet Unit Weight: 135.64 pcf	Mass Tare + Dry Soil, gm	212.77	219.36	473.61
Dry Unit Weight: 126.83 pcf	Water Content, %	6.94	7.39	8.34

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-26	Tested By: cwd	Checked By: jdt
Sample No.: Bulk(26A/26)	Test Date: 2/12/2014	Depth: 1-4 ft
Test No.: CBR-8	Sample Type: remolded	Elevation: ---
Description: Moist, very dark gray sand with silt and gravel		
Remarks: Target Compaction: 95% of maximum dry density (134.0 pcf) at optimum moisture content (6.5%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

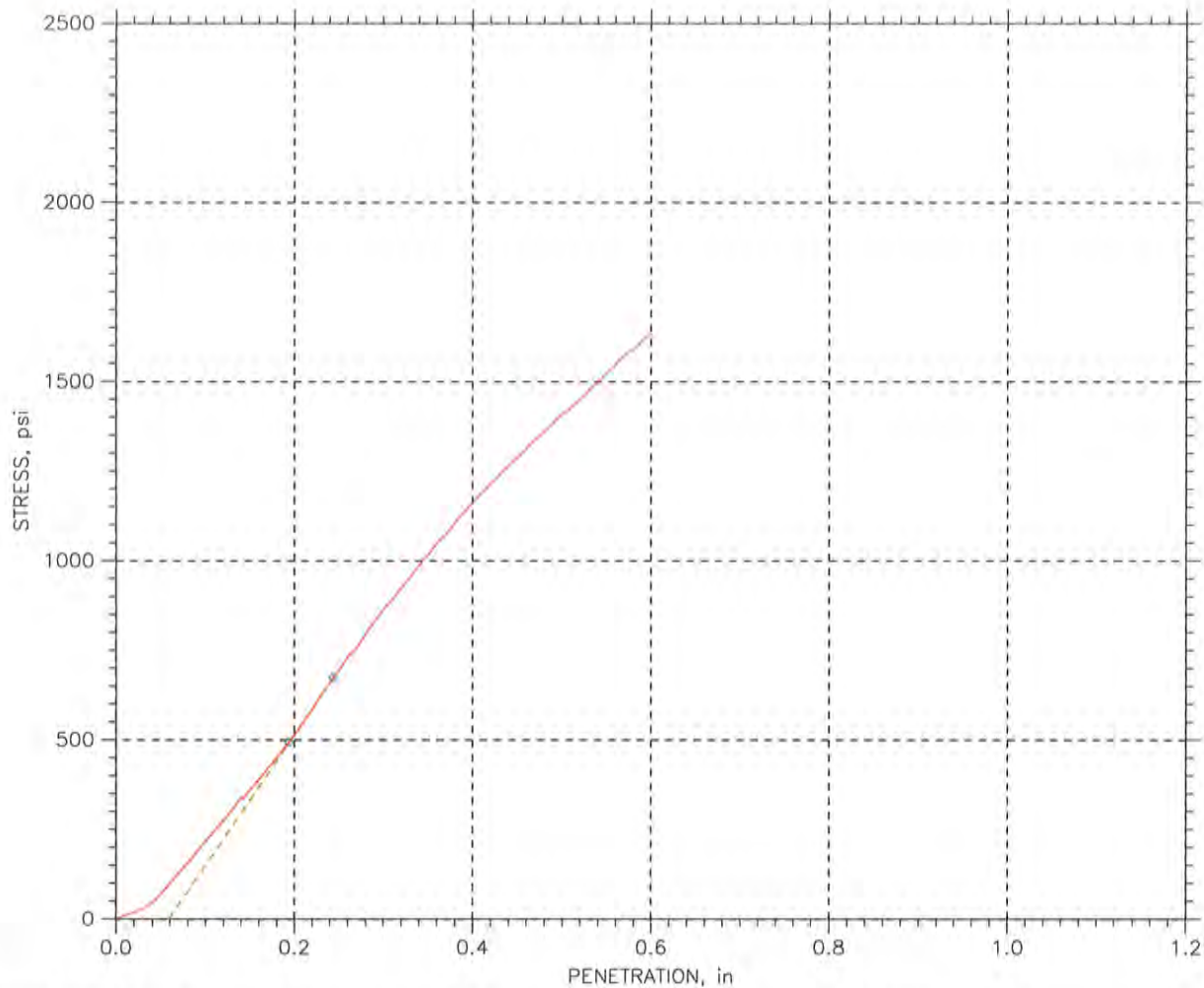


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 113	at 0.3 in: 143	at 0.5 in: N/A	
Sample Volume: 0.07494 ft^3	at 0.2 in: 141	at 0.4 in: 135		
Sample Mass: 4136.5 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.11 %	Tare ID	TARE13312	TARE13955	TARE13956
Surcharge: 4540 gm	Tare Mass, gm	8.17	8.23	8.26
Void Ratio: 0.49	Mass Tare + Wet Soil, gm	373.96	256.09	338.83
Wet Unit Weight: 121.69 pcf	Mass Tare + Dry Soil, gm	342.22	229.87	301.69
Dry Unit Weight: 111.13 pcf	Water Content, %	9.50	11.83	12.66

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-30	Tested By: cwd	Checked By: jdt
Sample No.: Bulk(31/32)	Test Date: 2/12/2014	Depth: 1-3 ft
Test No.: CBR-9	Sample Type: remolded	Elevation: ---
Description: Moist, black silty gravel with sand		
Remarks: Target Compaction: 95% of maximum dry density (117.0 pcf) at optimum moisture content (9.5%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

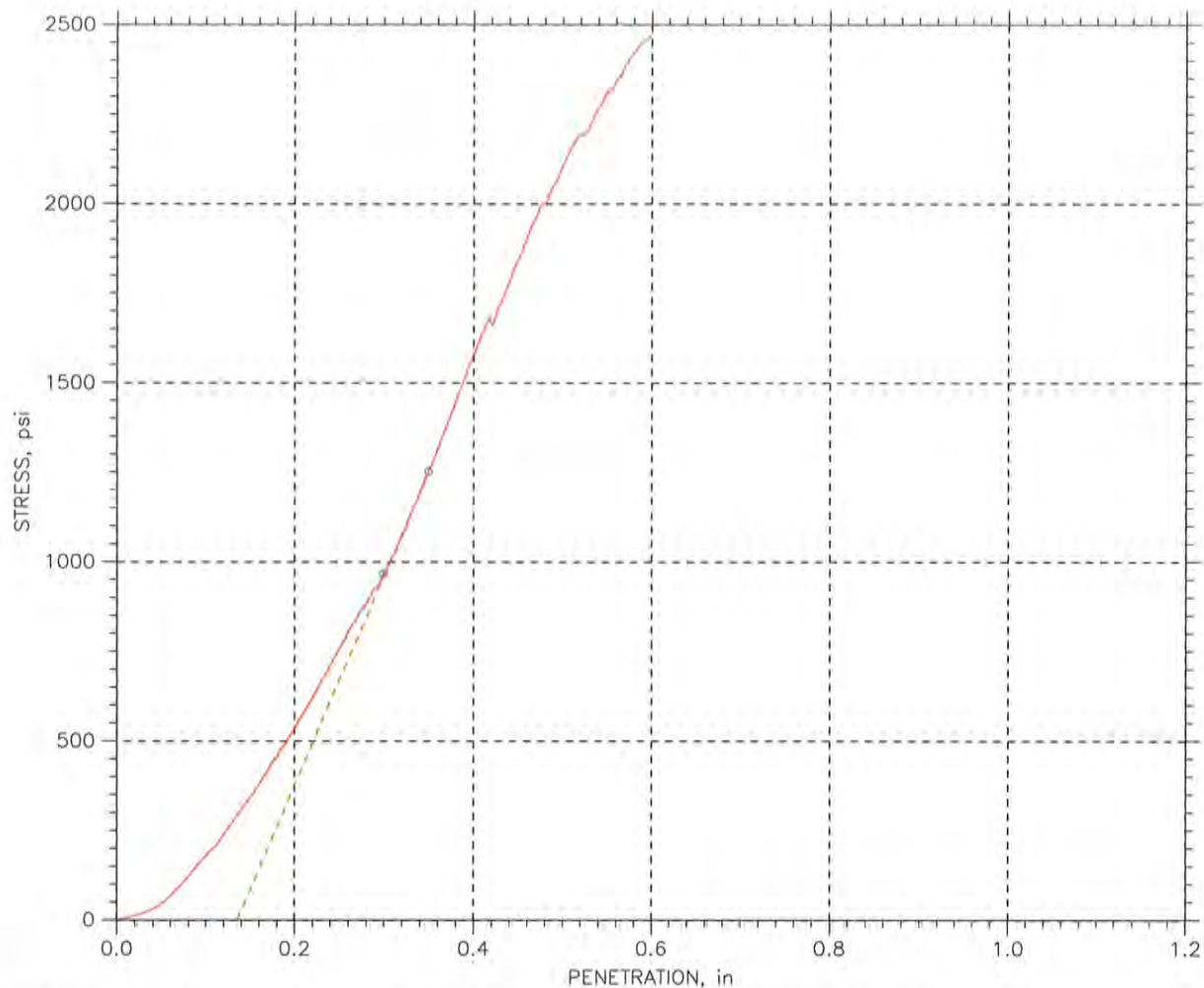


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 39	at 0.3 in: 55	at 0.5 in: 59	
Sample Volume: 0.07494 ft^3	at 0.2 in: 48	at 0.4 in: 57		
Sample Mass: 4223.4 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.07 %	Tare ID	TARE11569	TARE14154	TARE13735
Surcharge: 4540 gm	Tare Mass, gm	7.59	8.25	8.22
Void Ratio: 0.45	Mass Tare + Wet Soil, gm	397.08	335.59	413.49
Wet Unit Weight: 124.25 pcf	Mass Tare + Dry Soil, gm	366.18	307.62	371.89
Dry Unit Weight: 114.39 pcf	Water Content, %	8.62	9.34	11.44

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-37	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 1/16/2014	Depth: 1-5 ft
Test No.: CBR-2	Sample Type: remolded	Elevation: ---
Description: Moist, dark grayish brown sand with silt and gravel		
Remarks: Target Compaction: 95% of maximum dry density (120.5 pcf) at optimum moisture content (8.5%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

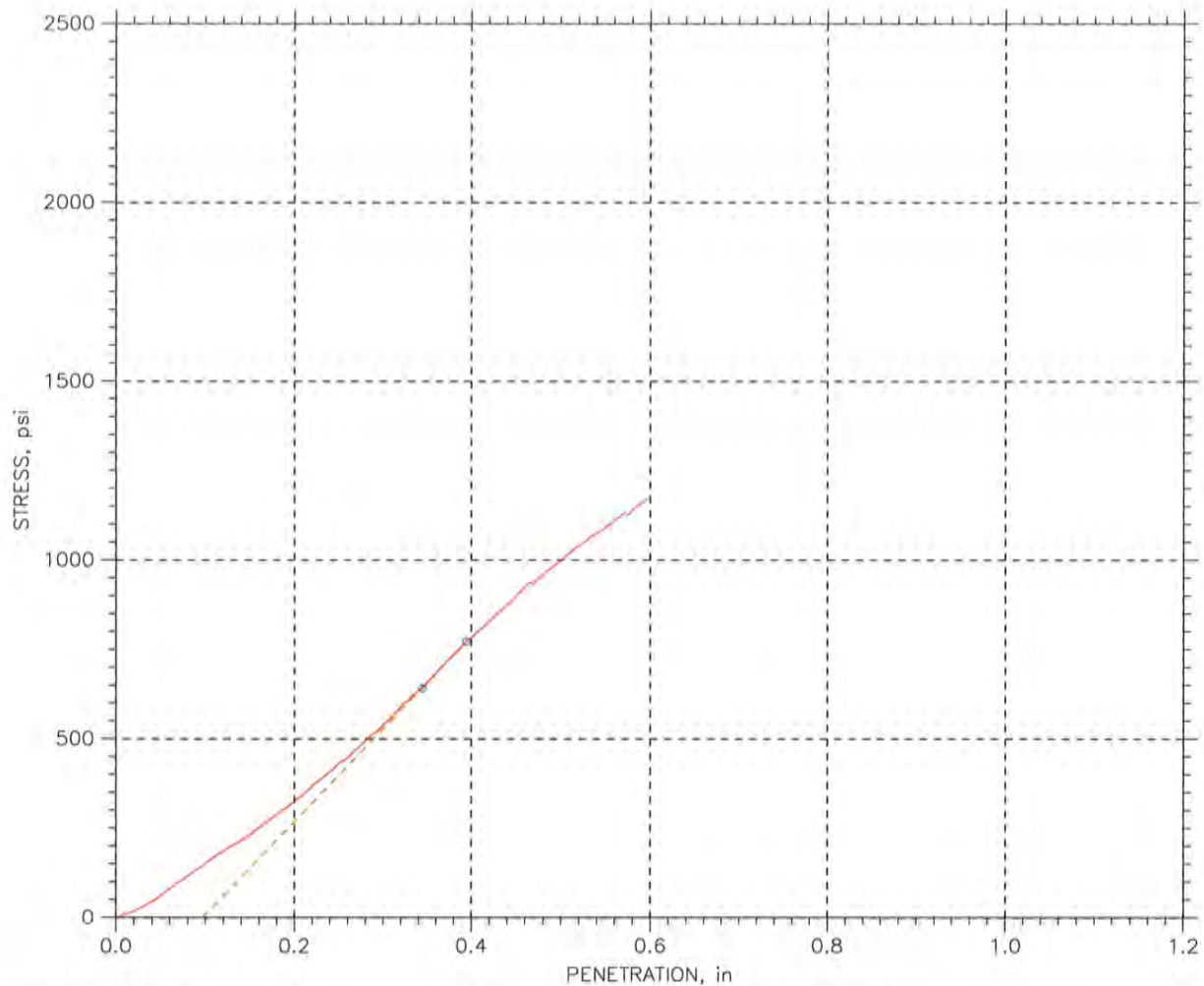


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 69	at 0.3 in: 93	at 0.5 in: N/A	
Sample Volume: 0.07494 ft^3	at 0.2 in: 78	at 0.4 in: 98		
Sample Mass: 4807.2 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.00 %	Tare ID	TARE13338	TARE13525	TARE13920
Surcharge: 4540 gm	Tare Mass, gm	8.1	8.27	8.4
Void Ratio: 0.24	Mass Tare + Wet Soil, gm	499.7	517.42	485.84
Wet Unit Weight: 141.42 pcf	Mass Tare + Dry Soil, gm	471.81	484.83	452.71
Dry Unit Weight: 133.4 pcf	Water Content, %	6.01	6.84	7.46

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-39	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 1/20/2014	Depth: 1-5 ft
Test No.: CBR-4	Sample Type: remolded	Elevation: ---
Description: Moist, very dark grayish brown gravel with silt and sand		
Remarks: Target Compaction: 95% of maximum dry density (140.5 pcf) at optimum moisture content (6.0%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

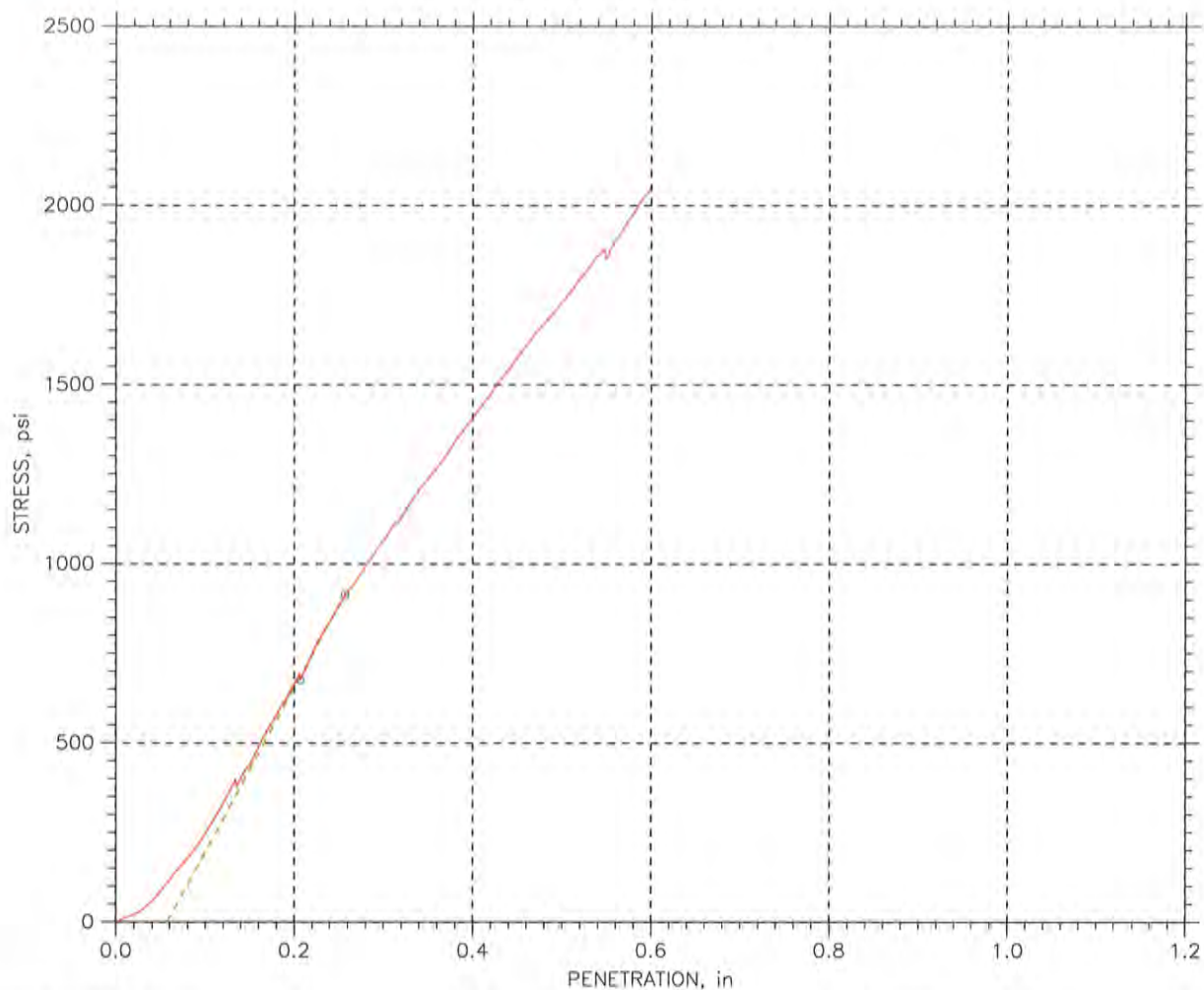


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 32	at 0.3 in: 41	at 0.5 in: 45	
Sample Volume: 0.07494 ft^3	at 0.2 in: 35	at 0.4 in: 43		
Sample Mass: 4511.5 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.00 %	Tare ID	TARE11882	TARE12276	TARE13898
Surcharge: 4540 gm	Tare Mass, gm	7.61	8.17	8.28
Void Ratio: 0.31	Mass Tare + Wet Soil, gm	465.07	414.93	467.82
Wet Unit Weight: 132.72 pcf	Mass Tare + Dry Soil, gm	443.22	385.03	432.26
Dry Unit Weight: 126.38 pcf	Water Content, %	5.02	7.93	8.39

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-41	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 1/20/2014	Depth: 1-5 ft
Test No.: CBR-5	Sample Type: remolded	Elevation: ---
Description: Moist, very dark gray sand with silt and gravel		
Remarks: Target Compaction: 95% of maximum dry density (133.0 pcf) at optimum moisture content (5.0%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883

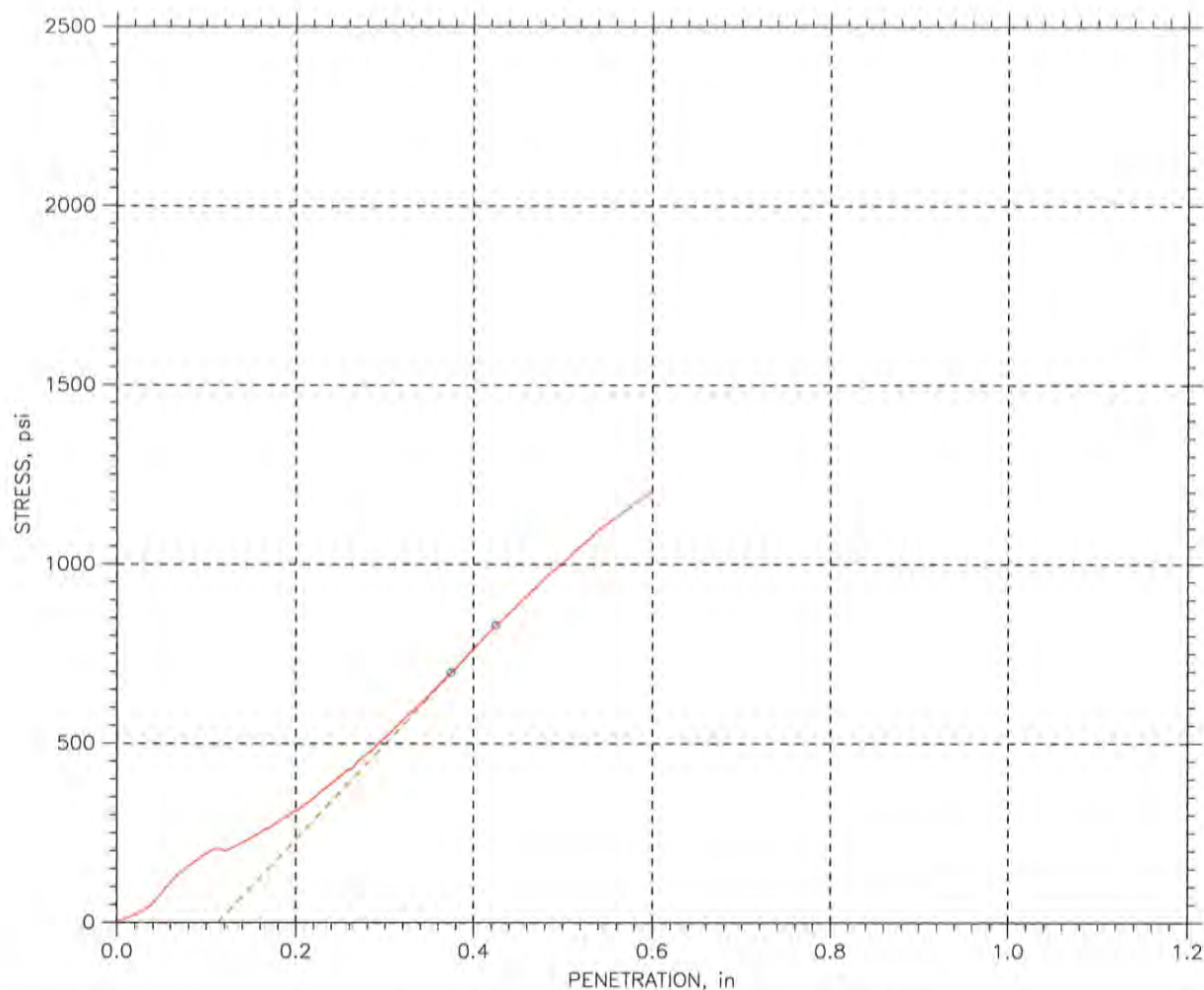


Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 48	at 0.3 in: 66	at 0.5 in: 73	
Sample Volume: 0.07494 ft^3	at 0.2 in: 61	at 0.4 in: 70		
Sample Mass: 4356.2 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.04 %	Tare ID	TARE13240	TARE12287	TARE12969
Surcharge: 4540 gm	Tare Mass, gm	8.35	8.11	8.18
Void Ratio: 0.35	Mass Tare + Wet Soil, gm	412.04	339.62	471.81
Wet Unit Weight: 128.15 pcf	Mass Tare + Dry Soil, gm	393.21	314.06	433.78
Dry Unit Weight: 122.18 pcf	Water Content, %	4.89	8.35	8.94

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-48	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 1/20/2014	Depth: 1-5 ft
Test No.: CBR-6	Sample Type: remolded	Elevation: ---
Description: Moist, very dark gray gravel with silt and sand		
Remarks: Target Compaction: 95% of maximum dry density (128.5 pcf) at optimum moisture content (5.0%).		



CALIFORNIA BEARING RATIO TEST REPORT by ASTM D 1883



Sample Height: 4.58 in	California Bearing Ratio			
Sample Area: 28.274 in^2	at 0.1 in: 33	at 0.3 in: 42	at 0.5 in: N/A	
Sample Volume: 0.07494 ft^3	at 0.2 in: 36	at 0.4 in: 45		
Sample Mass: 4544.3 gm				
Sample Condition: Soaked	Water Content	Before	Top	Average
Swell: 0.02 %	Tare ID	TARE13270	TARE13543	TARE13544
Surcharge: 4540 gm	Tare Mass, gm	16.48	8.15	8.19
Void Ratio: 0.32	Mass Tare + Wet Soil, gm	906.48	372.77	461.34
Wet Unit Weight: 133.69 pcf	Mass Tare + Dry Soil, gm	852.13	346.86	425.26
Dry Unit Weight: 125.52 pcf	Water Content, %	6.50	7.65	8.65

Project: Silverline	Location: Chelsea, MA	Project No.: GTX-301232
Boring No.: B-57	Tested By: cwd	Checked By: jdt
Sample No.: Bulk	Test Date: 1/20/2014	Depth: 1-5 ft
Test No.: CBR-7	Sample Type: remolded	Elevation: ---
Description: Moist, very dark gray sand with silt and gravel		
Remarks: Target Compaction: 95% of maximum dry density (132.0 pcf) at optimum moisture content (6.5%).		



ANALYTICAL REPORT

Lab Number:	L1324835
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	SILVERLINE
Project Number:	GTX :301232
Report Date:	12/10/13

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Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1324835-01	SPT-3, B-5, 4-6 FT	Not Specified	12/06/13 00:00
L1324835-02	SPT-3, B-1, 4-6 FT	Not Specified	12/06/13 00:00
L1324835-03	SPT-3, B-15, 4-6 FT	Not Specified	12/06/13 00:00

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.


HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cynthia McQueen

Title: Technical Director/Representative

Date: 12/10/13

INORGANICS & MISCELLANEOUS

Project Name: SILVERLINE

Lab Number: L1324835

Project Number: GTX :301232

Report Date: 12/10/13

SAMPLE RESULTS

Lab ID: L1324835-01
Client ID: SPT-3, B-5, 4-6 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 12/06/13 00:00
Date Received: 12/06/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	75.3		%	0.100	NA	1	-	12/06/13 22:42	30,2540G	RT
Chloride	93		mg/kg	13	--	1	-	12/09/13 11:25	1,9251	LA
Sulfate	ND		mg/kg	130	--	1	-	12/09/13 15:45	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1324835

Project Number: GTX :301232

Report Date: 12/10/13

SAMPLE RESULTS

Lab ID: L1324835-02

Date Collected: 12/06/13 00:00

Client ID: SPT-3, B-1, 4-6 FT

Date Received: 12/06/13

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	77.0		%	0.100	NA	1	-	12/06/13 22:42	30,2540G	RT
Chloride	24		mg/kg	12	--	1	-	12/09/13 11:25	1,9251	LA
Sulfate	160		mg/kg	130	--	1	-	12/09/13 15:45	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1324835

Project Number: GTX :301232

Report Date: 12/10/13

SAMPLE RESULTS

Lab ID: L1324835-03
Client ID: SPT-3, B-15, 4-6 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 12/06/13 00:00
Date Received: 12/06/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	76.2		%	0.100	NA	1	-	12/06/13 22:42	30,2540G	RT
Chloride	ND		mg/kg	12	--	1	-	12/09/13 11:26	1,9251	LA
Sulfate	ND		mg/kg	130	--	1	-	12/09/13 15:45	1,9038	MP



Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG657266-1										
Chloride	ND		mg/kg	10	--	1	-	12/09/13 10:53	1,9251	LA
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG657276-1										
Sulfate	ND		mg/kg	100	--	1	-	12/09/13 15:45	1,9038	MP



Lab Control Sample Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

Parameter	LCS		LCSD		%Recovery		RPD	Qual	RPD Limits
	%Recovery	Qual	%Recovery	Qual	%Recovery	Limits			
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG657266-2									
Chloride	99		-		89-109	-			35
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG657276-2									
Sulfate	98		-		80-121	-			12



Matrix Spike Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG657266-4 QC Sample: L1324419-02 Client ID: MS Sample										
Chloride	530	497	1000	105	-	-	-	62-129	-	35
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG657276-4 QC Sample: L1324664-03 Client ID: MS Sample										
Sulfate	ND	220	260	120	-	-	-	22-183	-	12



Lab Duplicate Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG656950-1 QC Sample: L1324772-01 Client ID: DUP Sample						
Solids, Total	88.2	91.2	%	3		20
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG657266-3 QC Sample: L1324419-02 Client ID: DUP Sample						
Chloride	530	520	mg/kg	2		35
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG657276-3 QC Sample: L1324835-01 Client ID: SPT-3, B-5, 4-6						
FT						
Sulfate	ND	ND	mg/kg	NC		12



Project Name: SILVERLINE

Lab Number: L1324835

Project Number: GTX :301232

Report Date: 12/10/13

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler

A Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1324835-01A	Glass 250ml unpreserved	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1324835-02A	Glass 250ml unpreserved	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1324835-03A	Glass 250ml unpreserved	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)

*Values in parentheses indicate holding time in days



Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	- Not Ignitable.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.

Report Format: Data Usability Report



Project Name: SILVERLINE

Lab Number: L1324835

Project Number: GTX :301232

Report Date: 12/10/13

Data Qualifiers

- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1324835
Report Date: 12/10/13

REFERENCES

- 1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.
- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certificate/Approval Program Summary

Last revised November 12, 2013 - Westboro Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0574. NELAP Accredited Solid Waste/Soil.

Drinking Water (Inorganic Parameters: Color, pH, Turbidity, Conductivity, Alkalinity, Chloride, Free Residual Chlorine, Fluoride, Calcium Hardness, Sulfate, Nitrate, Nitrite, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Selenium, Silver, Sodium, Thallium, Zinc, Total Dissolved Solids, Total Organic Carbon, Total Cyanide, Perchlorate. *Organic Parameters:* Volatile Organics 524.2, Total Trihalomethanes 524.2, 1,2-Dibromo-3-chloropropane (DBCP) 504.1, Ethylene Dibromide (EDB) 504.1, 1,4-Dioxane (Mod 8270). *Microbiology Parameters:* Total Coliform-MF mEndo (SM9222B), Total Coliform – Colilert (SM9223, Enumeration and P/A), E. Coli. – Colilert (SM9223, Enumeration and P/A), HPC – Pour Plate (SM9215B), Fecal Coliform – MF m-FC (SM9222D), Fecal Coliform-EC Medium (SM 9221E).

Wastewater/Non-Potable Water (Inorganic Parameters: Color, pH, Conductivity, Acidity, Alkalinity, Chloride, Total Residual Chlorine, Fluoride, Total Hardness, Silica, Sulfate, Sulfide, Ammonia, Kjeldahl Nitrogen, Nitrate, Nitrite, O-Phosphate, Total Phosphorus, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc, Total Residue (Solids), Total Dissolved Solids, Total Suspended Solids (non-filterable), BOD, CBOD, COD, TOC, Total Cyanide, Phenolics, Foaming Agents (MBAS), Bromide, Oil and Grease. *Organic Parameters:* PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables (Phenols), Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, Polynuclear Aromatic Hydrocarbons, Haloethers, Chlorinated Hydrocarbons, Volatile Organics, TPH (HEM/SGT), CT-Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH. *Microbiology Parameters:* Total Coliform – MF mEndo (SM9222B), Total Coliform – MTF (SM9221B), E. Coli – Colilert (SM9223 Enumeration), HPC – Pour Plate (SM9215B), Fecal Coliform – MF m-FC (SM9222D), Fecal Coliform – A-1 Broth (SM9221E), Enterococcus - Enterolert.

Solid Waste/Soil (Inorganic Parameters: pH, Sulfide, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Tin, Vanadium, Zinc, Total Cyanide, Ignitability, Phenolics, Corrosivity, TCLP Leach (1311), SPLP Leach (1312 metals only), Reactivity. *Organic Parameters:* PCBs, PCBs in Oil, Organochlorine Pesticides, Technical Chlordane, Toxaphene, CT-Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH, Dicamba, 2,4-D, 2,4,5-T, 2,4,5-TP(Silvex), Dalapon, Volatile Organics (SW 8260), Acid Extractables (Phenols) (SW 8270), Benzidines (SW 8270), Phthalates (SW 8270), Nitrosamines (SW 8270), Nitroaromatics & Cyclic Ketones (SW 8270), PAHs (SW 8270), Haloethers (SW 8270), Chlorinated Hydrocarbons (SW 8270).)

State of Illinois Certificate/Lab ID: 003155. NELAP Accredited.

Drinking Water (Inorganic Parameters: SM2120B, 2320B, 2510B, 2540C, SM4500CN-CE, 4500F-C, 4500H-B, 4500NO3-F, 5310C, EPA 200.7, 200.8, 245.1, 300.0. *Organic Parameters:* EPA 504.1, 524.2.)

Wastewater/Non-Potable Water (Inorganic Parameters: SM2120B, 2310B, 2320B, 2340B, 2510B, 2540B, 2540C, 2540D, SM4500CL-E, 4500CN-E, 4500F-C, 4500H-B, 4500NH3-H, 4500NO2-B, 4500NO3-F, 4500P-E, 4500S-D, 4500SO3-B, 5210B, 5220D, 5310C, 5540C, EPA 120.1, 1664A, 200.7, 200.8, 245.1, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1. *Organic Parameters:* EPA 608, 624, 625.)

Hazardous and Solid Waste (Inorganic Parameters: EPA 1010A, 1030, 1311, 1312, 6010C, 6020A, 7196A, 7470A, 7471B, 9012B, 9014, 9038, 9040C, 9045D, 9050A, 9065, 9251. *Organic Parameters:* 8011 (NPW only), 8015C, 8081B, 8082A, 8151A, 8260C, 8270D, 8315A, 8330.)

Maine Department of Human Services Certificate/Lab ID: 2009024.

Drinking Water (Inorganic Parameters: SM9215B, 9222D, 9223B, EPA 180.1, 353.2, SM2120B, 2130B, 2320B, 2510C, 2540C, 4500CI-D, 4500CN-C, 4500CN-E, 4500F-C, 4500H+B, 4500NO3-F, 5310C, EPA 200.7, EPA 200.8, 245.1, EPA 300.0. *Organic Parameters:* 504.1, 524.2.)

Wastewater/Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1, 8315A, 9010C, SM2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 426C, 4500CI-E, 4500CN-C, 4500CN-E, 4500F-B, 4500F-C, 4500H+B, 4500Norg-C, 4500NH3-B, 4500NH3-H, 4500NO2-B, 4500NO3-F, 4500P-B, 4500P-E, 4500S2-D, 4500SO3-B, 5540C, 5210B, 5220D, 5310C, 9010B, 9030B, 9040C, 7470A, 7196A, 2340B, EPA 200.7, 6010C, 200.8, 6020A, 245.1, 1311, 1312, 3005A, Enterolert, 9223B, 9222D. *Organic Parameters:* 608, 624, 625, 8011, 8081B, 8082A, 8330, 8151A, 8260C, 8270D, 3510C, 3630C, 5030B, ME-DRO, ME-GRO, MA-EPH, MA-VPH.)

Solid Waste/Soil (Inorganic Parameters: 9010B, 9012A, 9014, 9040B, 9045C, 6010C, 6020A, 7471B, 7196A, 9050A, 1010, 1030, 9065, 1311, 1312, 3005A, 3050B, 9038, 9251. *Organic Parameters:* ME-DRO, ME-GRO, MA-EPH, MA-VPH, 8260C, 8270D, 8330, 8151A, 8081B, 8082A, 3540C, 3546, 3580A, 3620C, 3630C, 5030B, 5035.)

Massachusetts Department of Environmental Protection Certificate/Lab ID: M-MA086.

Drinking Water (Inorganic Parameters: (EPA 200.8 for: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl) (EPA 200.7 for: Ba,Be,Ca,Cd,Cr,Cu,Na,Ni) 245.1, (300.0 for: Nitrate-N, Fluoride, Sulfate); (EPA 353.2 for: Nitrate-N, Nitrite-N); (SM4500NO3-F for: Nitrate-N and Nitrite-N); 4500F-C, 4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, 2320B, SM2540C, SM4500H-B. *Organic Parameters:* (EPA 524.2 for: Trihalomethanes, Volatile Organics); (504.1 for: 1,2-Dibromoethane, 1,2-Dibromo-3-Chloropropane), EPA 332. *Microbiology Parameters:* SM9215B; ENZ. SUB. SM9223; ColilertQT SM9223B; MF-SM9222D.)

Non-Potable Water (Inorganic Parameters: (EPA 200.8 for: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn); (EPA 200.7 for: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn); 245.1, SM4500H-B, EPA 120.1, SM2510B, 2540C, 2340B, 2320B, 4500CL-E, 4500F-BC, 426C, SM4500NH3-BH, (EPA 350.1 for: Ammonia-N), LACHAT 10-107-06-1-B for Ammonia-N, SM4500NO3-F, 353.2 for Nitrate-N, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, 4500P-B,E, 5220D, EPA 410.4, SM 5210B, 5310C, 4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.

Organic Parameters: (EPA 624 for Volatile Halocarbons, Volatile Aromatics),(608 for: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT,Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs-Water), (EPA 625 for SVOC Acid Extractables and SVOC Base/Neutral Extractables), 600/4-81-045-PCB-Oil. *Microbiology Parameters:* (ColilertQT SM9223B; Enterolert-QT: SM9222D-MF.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 200307. NELAP Accredited.

Drinking Water (Inorganic Parameters: SM 9222B, 9223B, 9215B, EPA 200.7, 200.8, 300.0, SM4500CN-E, 4500H+B, 4500NO3-F, 2320B, 2510B, 2540C, 4500F-C, 5310C, 2120B, EPA 332.0. *Organic Parameters:* 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: SM9222D, 9221B, 9222B, 9221E-EC, EPA 3005A, 200.7, 200.8, 245.1, SW-846 6010C, 6020A, 7196A, 7470A, SM3500-CR-D, EPA 120.1, 300.0, 350.1, 350.2, 351.1, 353.2, 410.4, 420.1, 426C, 1664A, SW-846 9010B, 9010C, 9030, 9040B, 9040C, SM2120B, 2310B, 2320B, 2340B, 2540B, 2540D, 4500H+B, 4500CL-E, 4500CN-E, 4500NH3-H, 4500NO3-F, 4500NO2-B, 4500P-E, 4500-S2-D, 4500SO3-B, 5210B, 5220D, 2510B, 2540C, 4500F-C, 5310C, 5540C, LACHAT 10-204-00-1-A, LACHAT 10-107-06-2-D, 3060A. *Organic Parameters:* SW-846 3510C, 3630C, 5030B, 8260C, 8270D, 8330, EPA 624, 625, 608, SW-846 8082A, 8081B, 8015C, 8151A, 8330, 8270D-SIM.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6010C, 6020A, 7196A, 7471B, 1010, 1010A, 1030, 9010C, 9012B, 9014, 9030B, 9040C, 9045C, 9045D, 9050, 9065, 9251, 1311, 1312, 3005A, 3050B, 3060A. *Organic Parameters:* SW-846 3540C, 3546, 3050B, 3580A, 3620D, 3630C, 5030B, 5035, 8260C, 8270D, 8270D-SIM, 8330, 8151A, 8015B, 8015C, 8082A, 8081B.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 2064. NELAP Accredited.

Drinking Water (Organic Parameters: EPA 524.2: Di-isopropyl ether (DIPE), Ethyl-t-butyl ether (ETBE), Tert-amyl methyl ether (TAME)).

Non-Potable Water (Organic Parameters: EPA 8260C: 1,3,5-Trichlorobenzene. EPA 8015C(M): TPH.)

Solid & Chemical Materials (Organic Parameters: EPA 8260C: 1,3,5-Trichlorobenzene.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA935. NELAP Accredited.

Drinking Water (Inorganic Parameters: SM9222B, 9221E, 9223B, 9215B, 4500CN-CE, 4500NO3-F, 4500F-C, EPA 300.0, 200.7, 200.8, 245.1, 2540C, SM2120B, 2320B, 2510B, 5310C, SM4500H-B. *Organic Parameters:* EPA 332, 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: SM5210B, EPA 410.4, SM5220D, 4500CI-E, EPA 300.0, SM2120B, 2340B, SM4500F-BC, EPA 200.7, 200.8, 351.1, LACHAT 10-107-06-2-D, EPA 353.2, SM4500NO3-F, 4500NO2-B, EPA 1664A, SM5310C, 4500-PE, EPA 420.1, SM4500P-B5+E, 2540B, 2540C, 2540D, EPA 120.1, SM2510B, 9222D, 9221B, 9221C, 9221E, 9222B, 9215B, 2310B, 2320B, 4500NH3-H, 4500-S D, 4500SO4-E, EPA 350.1, 350.2, SW-846 1312, 7470A, 5540C, SM4500H-B, 4500SO3-B, SM3500Cr-D, 4500CN-CE, EPA 245.1, SW-846 9040B, 9040C, 3005A, 3015, EPA 6010B, 6010C, 6020, 6020A, 7196A, 3060A, SW-846 9010C, 9030B. *Organic Parameters:* SW-846 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 3510C, EPA 608, 624, 625, SW-846 3630C, 5030B, 5030C, 8011, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8330, 1,4-Dioxane by NJ Modified 8270, 8015B, NJ EPH.)

Page 16 of 40 *Solid & Chemical Materials (Inorganic Parameters:* SW-846, 6010B, 6010C, 6020, 6020A, 7196A, 3060A, 9030B, 1010, 1010A, 1030, 1311, 1312, 3005A, 3050B, 7471A, 7471B, 9010C, 9012B, 9014, 9038, 9040B, 9040C, 9045C, 9045D,

9050A, 9065, 9251. Organic Parameters: SW-846 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8330, 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 3540C, 3546, 3580A, 3620C, 3630C, 5030B, 5030C, 5035L, 5035H, NJ EPH.)

New York Department of Health Certificate/Lab ID: 11148. NELAP Accredited.

Drinking Water (Inorganic Parameters: SM9223B, 9222B, 9215B, EPA 200.8, 200.7, 245.1, SM5310C, EPA 332.0, SM2320B, EPA 300.0, SM2120B, 4500CN-E, 4500F-C, 4500NO₃-F, 2540C, SM 2510B. Organic Parameters: EPA 524.2, 504.1.)

Non-Potable Water (Inorganic Parameters: SM9221E, 9222D, 9221B, 9222B, 9215B, 5210B, 5310C, EPA 410.4, SM5220D, 2310B, 2320B, EPA 200.7, 300.0, SM4500CL-E, 4500F-C, SM15 426C, EPA 350.1, SM4500NH₃-BH, EPA 351.1, LACHAT 10-107-06-2, EPA 353.2, SM4500-NO₃-F, 4500-NO₂-B, 4500P-E, 2340B, 2540C, 2540B, 2540D, EPA 200.8, EPA 6010C, 6020A, EPA 7196A, SM3500Cr-D, EPA 245.1, 7470A, SM2120B, 4500CN-CE, EPA 1664A, EPA 420.1, SM14 510C, EPA 120.1, SM2510B, SM4500S-D, SM5540C, EPA 8315A, 3005A, 9010C, 9030B. Organic Parameters: EPA 624, 8260C, 8270D, 8270D-SIM, 625, 608, 8081B, 8151A, 8330A, 8082A, EPA 3510C, 5030B, 5030C, 8015C, 8011.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1010A, 1030, EPA 6010C, 6020A, 7196A, 7471B, 8315A, 9012B, 9014, 9065, 9050A, 9038, 9251, EPA 1311, 1312, 3005A, 3050B, 9010C, 9030B, 9040C, 9045D. Organic Parameters: EPA 8260C, 8270D, 8270D-SIM, 8015C, 8081B, 8151A, 8330A, 8082A, 3540C, 3546, 3580A, 5035A-H, 5035A-L.)

North Carolina Department of the Environment and Natural Resources Certificate/Lab ID: 666. (Inorganic

Parameters: SM2310B, 2320B, 4500Cl-E, 4500Cn-E, 9012B, 9014, Lachat 10-204-00-1-X, 1010A, 1030, 4500NO₃-F, 353.2, 4500P-E, 4500SO₄-E, 300.0, 4500S-D, 5310B, 5310C, 6010C, 6020A, 200.7, 200.8, 3500Cr-B, 7196A, 245.1, 7470A, 7471B, 1311, 1312. Organic Parameters: 608, 8081B, 8082A, 624, 8260B, 625, 8270D, 8151A, 8015C, 504.1, MA-EPH, MA-VPH.)

Drinking Water Program Certificate/Lab ID: 25700. (Inorganic Parameters: Chloride EPA 300.0. *Organic Parameters*: 524.2)

Pennsylvania Department of Environmental Protection Certificate/Lab ID: 68-03671. NELAP Accredited.

Drinking Water (Inorganic Parameters: 200.7, 200.8, 300.0, 332.0, 2120B, 2320B, 2510B, 2540C, 4500-CN-CE, 4500F-C, 4500H+-B, 4500NO₃-F, 5310C. Organic Parameters: EPA 524.2, 504.1)

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1312, 3005A, 3015, 3060A, 200.7, 200.8, 410.4, 1664A, SM2540D, 5210B, 5220D, 4500-P, BE, 245.1, 300.0, 350.1, 350.2, 351.1, 353.2, 420.1, 6010C, 6020A, 7196A, 7470A, 9030B, 2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 3500Cr-D, 426C, 4500CN-CE, 4500Cl-E, 4500F-B, 4500F-C, 4500H+-B, 4500NH₃-H, 4500NO₂-B, 4500NO₃-F, 4500S-D, 4500SO₃-B, 5310BCD, 5540C, 9010C, 9040C. Organic Parameters: EPA 3510C, 3630C, 5030B, 625, 624, 608, 8081B, 8082A, 8151A, 8260C, 8270D, 8270D-SIM, 8330, 8015C, NJ-EPH.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 350.1, 1010, 1030, 1311, 1312, 3005A, 3050B, 3060A, 6010C, 6020A, 7196A, 7471B, 9010C, 9012B, 9014, 9040B, 9045D, 9050A, 9065, SM 4500NH₃-BH, 9030B, 9038, 9251. Organic Parameters: 3540C, 3546, 3580A, 3620C, 3630C, 5035, 8015C, 8081B, 8082A, 8151A, 8260C, 8270D, 8270D-SIM, 8330, NJ-EPH.)

Rhode Island Department of Health Certificate/Lab ID: LAO00065. NELAP Accredited via NJ-DEP.

Refer to MA-DEP Certificate for Potable and Non-Potable Water.

Refer to NJ-DEP Certificate for Potable and Non-Potable Water.

Texas Commission on Environmental Quality Certificate/Lab ID: T104704476. NELAP Accredited.

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664, 200.7, 200.8, 245.1, 245.2, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1, 6010, 6020, 7196, 7470, 9040, SM 2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 426C, 4500CL-E, 4500CN-E, 4500F-C, 4500H+B, 4500NH₃-H, 4500NO₂B, 4500P-E, 4500 S²⁻ D, 510C, 5210B, 5220D, 5310C, 5540C. Organic Parameters: EPA 608, 624, 625, 8081, 8082, 8151, 8260, 8270, 8330.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 1312, 9012, 9014, 9040, 9045, 9050, 9065.)

Virginia Division of Consolidated Laboratory Services Certificate/Lab ID: 460195. NELAP Accredited.

Drinking Water (Inorganic Parameters: EPA 200.7, 200.8, 300.0, 2510B, 2120B, 2540C, 4500CN-CE, 245.1, 2320B, 4500F-C, 4500NO₃-F, 4500H+B, 5310C. Organic Parameters: EPA 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 200.7, 200.8, 245.1, 300.0, 350.1, 351.1, 351.2, 3005A, 3015, 1312, 6010B, 6010C, 3060A, 353.2, 420.1, 2340B, 6020, 6020A, SM4500S-D, SM4500-CN-CE, Lachat 10-204-00-1-X, 7196A, 7470A, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 3500Cr-D, 426C, 4500Cl-E, 4500F-B, 4500F-C,

4500NH3-H, 4500NO2-B, 4500NO3-F, 4500 SO3-B, 4500H-B, 4500PE, 510AC, 5210B, 5310B 5310C, 5540C, 9010Cm 9030B, 9040C. Organic Parameters: EPA 3510C, 3630C, 5030B, 8260B, 608, 624, 625, 8011, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330,)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1010A, 1030, 3060A, 3050B, 1311, 1312, 6010B, 6010C, 6020, , 7196A, 7471A, 7471B, 6020A, 9010C, 9012B, 9030B, 9014, 9038, 9040C, 9045D, 9251, 9050A, 9065. Organic Parameters: EPA 5030B, 5035, 3540C, 3546, 3550B, 3580A, 3620C, 3630C, 6020A, 8260B, 8260C, 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330.)

Department of Defense, L-A-B Certificate/Lab ID: L2217.

Drinking Water (Inorganic Parameters: SM 4500H-B. Organic Parameters: EPA 524.2, 504.1.)

Non-Potable Water (Inorganic Parameters: EPA 200.7, 200.8, 6010C, 6020A, 245.1, 7470A, 9040B, 9010B, 180.1, 300.0, 332.0, 6860, 351.1, 353.2, 9060, 1664A, SM 4500CN-E, 4500H-B, 4500Norg-C, 4500NO3-F, 5310C, 2130B, 2320B, 2340B, 2540C, 5540C, 3005A, 3015, 9056, 7196A, 3500-Cr-D. Organic Parameters: EPA 8015C, 8151A, 8260C, 8270D, 8270D-SIM, 8330A, 8082A, 8081B, 3510C, 5030B, MassDEP EPH, MassDEP VPH.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 200.7, 6010C, 6020A, 7471A, 6860, 1311, 1312, 3050B, 7196A, 9040B, 9045C, 9010C, 9012B, 9251, SM3500-CR-D, 4500CN-CE, 2540G, Organic Parameters: EPA 8015C, 8151A, 8260C, 8270D, 8270D-SIM, 8330A/B-prep, 8082A, 8081B, 3540C, 3546, 3580A, 5035A, MassDEP EPH, MassDEP VPH.)

The following analytes are not included in our current NELAP/TNI Scope of Accreditation:

EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether. **EPA 8260B:** 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene. **EPA 8260 Non-potable water matrix:** Iodomethane (methyl iodide), Methyl methacrylate. **EPA 8260 Soil matrix:** Tert-amyl methyl ether (TAME), Diisopropyl ether (DIPE), Azobenzene. **EPA 8330A:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT. **EPA 8270C:** Methyl naphthalene, Dimethyl naphthalene, Total Methyl naphthalenes, Total Dimethyl naphthalenes, 1,4-Diphenylhydrazine. **EPA 625:** 4-Chloroaniline, 4-Methylphenol. Total Phosphorus in a soil matrix, TKN in a soil matrix, NO2 in a soil matrix, NO3 in a soil matrix. **EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease. **EPA 9060** in a soil matrix.

FORM NO: 01-01 (rev. 14-OCT-07)



ANALYTICAL REPORT

Lab Number:	L1402089
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	SILVERLINE
Project Number:	GTX: 301232
Report Date:	01/28/14

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1402089-01	SPT-2, B-28, 9-11 FT	Not Specified	01/24/14 00:00

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

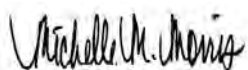
HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Michelle M. Morris

Title: Technical Director/Representative

Date: 01/28/14

INORGANICS & MISCELLANEOUS

Project Name: SILVERLINE

Lab Number: L1402089

Project Number: GTX: 301232

Report Date: 01/28/14

SAMPLE RESULTS

Lab ID: L1402089-01
Client ID: SPT-2, B-28, 9-11 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 01/24/14 00:00
Date Received: 01/24/14
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	83.9		%	0.100	NA	1	-	01/24/14 22:23	30,2540G	RT
Chloride	ND		mg/kg	11	--	1	-	01/28/14 11:31	1,9251	LA
Sulfate	ND		mg/kg	120	--	1	-	01/27/14 16:30	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1402089

Project Number: GTX: 301232

Report Date: 01/28/14

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG666923-1										
Sulfate	ND		mg/kg	100	--	1	-	01/27/14 16:30	1,9038	MP
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG667160-1										
Chloride	ND		mg/kg	10	--	1	-	01/28/14 11:30	1,9251	LA



Lab Control Sample Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

Parameter	LCS		LCSD		%Recovery		RPD	Qual	RPD Limits
	%Recovery	Qual	%Recovery	Qual	Limits				
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG666923-2									
Sulfate	101		-		80-121	-			12
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG667160-2									
Chloride	98		-		89-109	-			35



Matrix Spike Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG666923-4 QC Sample: L1402089-01 Client ID: SPT-2, B-28, 9-11 FT											
Sulfate	ND	240	240	100	-	-	-	-	22-183	-	12
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG667160-4 QC Sample: L1402089-01 Client ID: SPT-2, B-28, 9-11 FT											
Chloride	ND	462	450	98	-	-	-	-	62-129	-	35



Lab Duplicate Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG666786-1 QC Sample: L1402071-01 Client ID: DUP Sample						
Solids, Total	95.3	95.3	%	0		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG666923-3 QC Sample: L1402089-01 Client ID: SPT-2, B-28, 9-11 FT						
Sulfate	ND	ND	mg/kg	NC		12
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG667160-3 QC Sample: L1402089-01 Client ID: SPT-2, B-28, 9-11 FT						
Chloride	ND	ND	mg/kg	NC		35



Project Name: SILVERLINE

Lab Number: L1402089

Project Number: GTX: 301232

Report Date: 01/28/14

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler

A Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1402089-01A	Bag	A	N/A	3.6	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)

*Values in parentheses indicate holding time in days



Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	- Not Ignitable.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.

Report Format: Data Usability Report



Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

Data Qualifiers

- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report



Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1402089
Report Date: 01/28/14

REFERENCES

- 1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.
- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

Last revised December 11, 2013

The following analytes are not included in our NELAP Scope of Accreditation:

Westborough Facility

EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.

EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.

EPA 8330A/B: PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT.

EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene, 1,4-Diphenylhydrazine.

EPA 625: 4-Chloroaniline, 4-Methylphenol.

SM4500: Soil: Total Phosphorus, TKN, NO₂, NO₃.

EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility

EPA 8270D: Biphenyl.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water

EPA 200.8: Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Tl; **EPA 200.7:** Ba, Be, Ca, Cd, Cr, Cu, Na; **EPA 245.1:** Mercury;

EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

EPA 332: Perchlorate.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.

Non-Potable Water

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn;

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, Ti, Tl, V, Zn;

EPA 245.1, SM4500H-B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC,

SM426C, SM4500NH3-BH, EPA 350.1: Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F,**

EPA 353.2: Nitrate-N, **SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4,**

SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.

EPA 624: Volatile Halocarbons & Aromatics,

EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



ANALYTICAL REPORT

Lab Number:	L1325678
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	SILVERLINE
Project Number:	GTX :301232
Report Date:	12/26/13

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

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508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1325678
Report Date: 12/26/13

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1325678-01	SPT-1, B-24, 2-4 FT	Not Specified	12/18/13 00:00
L1325678-02	SPT-1, B-33, 2-4 FT	Not Specified	12/18/13 00:00

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1325678
Report Date: 12/26/13

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

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Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.


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Please contact Client Services at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cynthia McQueen

Title: Technical Director/Representative

Date: 12/26/13

INORGANICS & MISCELLANEOUS

Project Name: SILVERLINE

Lab Number: L1325678

Project Number: GTX :301232

Report Date: 12/26/13

SAMPLE RESULTS

Lab ID: L1325678-01
Client ID: SPT-1, B-24, 2-4 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 12/18/13 00:00
Date Received: 12/18/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	89.6		%	0.100	NA	1	-	12/18/13 23:24	30,2540G	RT
Chloride	38		mg/kg	11	--	1	-	12/24/13 09:12	1,9251	LA
Sulfate	120		mg/kg	110	--	1	-	12/20/13 14:15	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1325678

Project Number: GTX :301232

Report Date: 12/26/13

SAMPLE RESULTS

Lab ID: L1325678-02
Client ID: SPT-1, B-33, 2-4 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 12/18/13 00:00
Date Received: 12/18/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	96.1		%	0.100	NA	1	-	12/18/13 23:24	30,2540G	RT
Chloride	ND		mg/kg	10	--	1	-	12/24/13 09:13	1,9251	LA
Sulfate	ND		mg/kg	100	--	1	-	12/20/13 14:15	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1325678

Project Number: GTX :301232

Report Date: 12/26/13

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG660563-1										
Sulfate	ND		mg/kg	100	--	1	-	12/20/13 14:15	1,9038	MP
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG661235-1										
Chloride	ND		mg/kg	1.0	--	1	-	12/24/13 09:04	1,9251	LA



Lab Control Sample Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1325678
Report Date: 12/26/13

Parameter	LCS %Recovery	Qual	LCS %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG660563-2								
Sulfate	100		-		80-121	-		12
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG661235-2								
Chloride	93		-		89-109	-		35



Matrix Spike Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1325678
Report Date: 12/26/13

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	%Recovery Qual	MSD %Recovery Qual	Recovery Limits	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG660563-4 QC Sample: L1325601-02 Client ID: MS Sample											
Sulfate	ND	244	290	120		-	-	-	22-183	-	12
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG661235-4 QC Sample: L1325601-02 Client ID: MS Sample											
Chloride	170	408	650	91		-	-	-	62-129	-	35



Lab Duplicate Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1325678
Report Date: 12/26/13

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG660124-1 QC Sample: L1324748-19 Client ID: DUP Sample						
Solids, Total	84.1	84.8	%	1		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG660563-3 QC Sample: L1325601-01 Client ID: DUP Sample						
Sulfate	ND	ND	mg/kg	NC		12
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG661235-3 QC Sample: L1325601-02 Client ID: DUP Sample						
Chloride	170	180	mg/kg	6		35



Project Name: SILVERLINE

Lab Number: L1325678

Project Number: GTX :301232

Report Date: 12/26/13

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler

A Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1325678-01A	Bag	A	N/A	2.9	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1325678-02A	Bag	A	N/A	2.9	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)

*Values in parentheses indicate holding time in days



Project Name: SILVERLINE

Lab Number: L1325678

Project Number: GTX :301232

Report Date: 12/26/13

GLOSSARY**Acronyms**

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	- Not Ignitable.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.

Report Format: Data Usability Report



Project Name: SILVERLINE

Lab Number: L1325678

Project Number: GTX :301232

Report Date: 12/26/13

Data Qualifiers

- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



Project Name: SILVERLINE
Project Number: GTX :301232

Lab Number: L1325678
Report Date: 12/26/13

REFERENCES

- 1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.
- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

Last revised December 11, 2013

The following analytes are not included in our NELAP Scope of Accreditation:

Westborough Facility

EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.

EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.

EPA 8330A/B: PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT.

EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene, 1,4-Diphenylhydrazine.

EPA 625: 4-Chloroaniline, 4-Methylphenol.

SM4500: Soil: Total Phosphorus, TKN, NO₂, NO₃.

EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility

EPA 8270D: Biphenyl.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water

EPA 200.8: Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Tl; **EPA 200.7:** Ba, Be, Ca, Cd, Cr, Cu, Na; **EPA 245.1:** Mercury;

EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

EPA 332: Perchlorate.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.

Non-Potable Water

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn;

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, Ti, Tl, V, Zn;

EPA 245.1, SM4500H-B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC,

SM426C, SM4500NH3-BH, EPA 350.1: Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F,**

EPA 353.2: Nitrate-N, **SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4,**

SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.

EPA 624: Volatile Halocarbons & Aromatics,

EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Page 16 of 16



ANALYTICAL REPORT

Lab Number:	L1401425
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	SILVERLINE
Project Number:	GTX: 301232
Report Date:	01/20/14

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1401425
Report Date: 01/20/14

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1401425-01	BULK, B-50, 1-5 FT	Not Specified	01/15/14 00:00
L1401425-02	SPT-1, B-53, 6-8 FT	Not Specified	01/15/14 00:00

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1401425
Report Date: 01/20/14

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

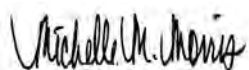
Case Narrative (continued)

Sample Receipt

The sample collection date was specified by the client.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Michelle M. Morris

Title: Technical Director/Representative

Date: 01/20/14

INORGANICS & MISCELLANEOUS

Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

SAMPLE RESULTS

Lab ID: L1401425-01
Client ID: BULK, B-50, 1-5 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 01/15/14 00:00
Date Received: 01/15/14
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	88.4		%	0.100	NA	1	-	01/16/14 00:47	30,2540G	RT
Chloride	ND		mg/kg	11	--	1	-	01/20/14 11:05	1,9251	LA
Sulfate	ND		mg/kg	110	--	1	-	01/17/14 17:45	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

SAMPLE RESULTS

Lab ID: L1401425-02
Client ID: SPT-1, B-53, 6-8 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 01/15/14 00:00
Date Received: 01/15/14
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	23.0		%	0.100	NA	1	-	01/16/14 00:47	30,2540G	RT
Chloride	3700		mg/kg	39	--	1	-	01/20/14 11:05	1,9251	LA
Sulfate	5000		mg/kg	2200	--	5	-	01/17/14 17:45	1,9038	MP



Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG665035-1										
Sulfate	ND		mg/kg	100	--	1	-	01/17/14 17:45	1,9038	MP
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG665663-1										
Chloride	ND		mg/kg	10	--	1	-	01/20/14 10:14	1,9251	LA



Lab Control Sample Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1401425
Report Date: 01/20/14

Parameter	LCS %Recovery	Qual	LCS %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG665035-2								
Sulfate	94		-		80-121	-		12
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG665663-2								
Chloride	104		-		89-109	-		35



Matrix Spike Analysis Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1401425
Report Date: 01/20/14

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG665035-4 QC Sample: L1401425-02 Client ID: SPT-1, B-53, 6-8 FT										
Sulfate	5000	870	6200	140	-	-	-	22-183	-	12
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG665663-4 QC Sample: L1401427-01 Client ID: MS Sample										
Chloride	17	422	450	107	-	-	-	62-129	-	35

Lab Duplicate Analysis
Batch Quality Control

Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1401425
Report Date: 01/20/14

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab	Associated sample(s): 01-02	QC Batch ID: WG664924-1	QC Sample: L1401288-01	Client ID: DUP Sample		
Solids, Total	76.3	77.2	%	1		20
General Chemistry - Westborough Lab	Associated sample(s): 01-02	QC Batch ID: WG665035-3	QC Sample: L1401425-01	Client ID: BULK, B-50, 1-5		
FT						
Sulfate	ND	ND	mg/kg	NC		12
General Chemistry - Westborough Lab	Associated sample(s): 01-02	QC Batch ID: WG665663-3	QC Sample: L1401427-01	Client ID: DUP Sample		
Chloride	17	19	mg/kg	11		35



Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler

A Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1401425-01A	Bag	A	N/A	2.8	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1401425-02A	Bag	A	N/A	2.8	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)

*Values in parentheses indicate holding time in days



Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

GLOSSARY**Acronyms**

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
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RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

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Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.

Report Format: Data Usability Report



Project Name: SILVERLINE

Lab Number: L1401425

Project Number: GTX: 301232

Report Date: 01/20/14

Data Qualifiers

- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



Project Name: SILVERLINE
Project Number: GTX: 301232

Lab Number: L1401425
Report Date: 01/20/14

REFERENCES

- 1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.
- 30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

Last revised December 11, 2013

The following analytes are not included in our NELAP Scope of Accreditation:

Westborough Facility

EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.

EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.

EPA 8330A/B: PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT.

EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene, 1,4-Diphenylhydrazine.

EPA 625: 4-Chloroaniline, 4-Methylphenol.

SM4500: Soil: Total Phosphorus, TKN, NO₂, NO₃.

EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility

EPA 8270D: Biphenyl.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water

EPA 200.8: Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Tl; **EPA 200.7:** Ba, Be, Ca, Cd, Cr, Cu, Na; **EPA 245.1:** Mercury;

EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

EPA 332: Perchlorate.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.

Non-Potable Water

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn;

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, Ti, Tl, V, Zn;

EPA 245.1, SM4500H-B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC,

SM426C, SM4500NH3-BH, EPA 350.1: Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F,**

EPA 353.2: Nitrate-N, **SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4,**

SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.

EPA 624: Volatile Halocarbons & Aromatics,

EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.




Client:	AECOM
Project Name:	Silverline
Project Location:	Chelsea, MA
GTX #:	301232
Test Date:	1/17/2014
Tested By:	daa/mth
Checked By:	jdt

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample ID	Depth, ft	Bulk Density, lb/ft ³	Compressive Strength, psi	Failure Type	In conformance with ASTM D4543
B-47	Run 1	104.44-104.81	168	4,339	2	YES

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.
All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure (See attached photographs)

	Client: AECOM	Test Date: 1/17/2014
	Project Name: Silverline Project Location: Chelsea, MA GTX #: 301232	Tested By: daa/mth Checked By: Jdt
Visual Description: See photographs	Boring ID: B-47	
	Sample ID: Run 1	
	Depth: 104.44-104.81 ft	

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY			DEVIATION FROM STRAIGHTNESS (Procedure S1)		
1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap ≤ 0.02 in.?		
4.32	4.32	4.32	YES		
1.99	1.99	1.99			
593.12					
168					
2.2					
END FLATNESS AND PARALLELISM (Procedure FP1)			Straightness Tolerance Met?		
END 1			YES		
Diameter 1, in	-0.875	-0.375	0.375	0.500	0.625
Diameter 2, in (rotated 90°)	-0.00050	-0.00040	0.00020	0.00030	0.00040
	0.00070	0.00060	-0.00020	-0.00030	-0.00050
			-0.00010	-0.00010	-0.00060
END 2			90° = 0.00090 90° = 0.00130		
Diameter 1, in	-0.875	-0.375	0.375	0.500	0.625
Diameter 2, in (rotated 90°)	-0.00050	-0.00040	0.00020	0.00030	0.00040
	0.00070	0.00060	-0.00010	-0.00030	-0.00050
			-0.00010	-0.00010	-0.00060
Difference between max and min readings, in:			0.0013		
Maximum difference must be < 0.0020 in.			Difference = ± 0.00065		
Flatness Tolerance Met?			YES		
DIAMETER 1			DIAMETER 2		
End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
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End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
Maximum Angular Difference:			Maximum Angular Difference:		
Parallelism Tolerance Met?			Parallelism Tolerance Met?		
Spherically Seated			Spherically Seated		
DIAMETER 1			DIAMETER 2		
End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
Maximum Angular Difference:			Maximum Angular Difference:		
Parallelism Tolerance Met?			Parallelism Tolerance Met?		
Spherically Seated			Spherically Seated		
DIAMETER 1			DIAMETER 2		
End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
Maximum Angular Difference:			Maximum Angular Difference:		
Parallelism Tolerance Met?			Parallelism Tolerance Met?		
Spherically Seated			Spherically Seated		
DIAMETER 1			DIAMETER 2		
End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
Maximum Angular Difference:			Maximum Angular Difference:		
Parallelism Tolerance Met?			Parallelism Tolerance Met?		
Spherically Seated			Spherically Seated		
DIAMETER 1			DIAMETER 2		
End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
Maximum Angular Difference:			Maximum Angular Difference:		
Parallelism Tolerance Met?			Parallelism Tolerance Met?		
Spherically Seated			Spherically Seated		
DIAMETER 1			DIAMETER 2		
End 1:			End 1:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
End 2:			End 2:		
Slope of Best Fit Line:			Slope of Best Fit Line:		
Angle of Best Fit Line:			Angle of Best Fit Line:		
Maximum Angular Difference:			Maximum Angular Difference:		
Parallelism Tolerance Met?			Parallelism Tolerance Met?		



Client:	AECOM
Project Name:	Silverline
Project Location:	Chelsea, MA
GTX #:	301232
Test Date:	1/17/2014
Tested By:	daa/mth
Checked By:	jdt
Boring ID:	B-47
Sample ID:	Run 1
Depth, ft:	104.44-104.81



After cutting and grinding



After break